INSTRUCTION BOOK

for

ARC TYPE BTK-17
BENCH TEST KIT

Aircraft Radio Corporation
BOONTON, NEW JERSEY

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BOONTON, NEW JERSEY

ARCIB-17-1

April 1957

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ARC reserves the right to make changes in design or additions to or improvements in its equipment without obligation to install such additions or improvements in equipment theretofore manufactured.

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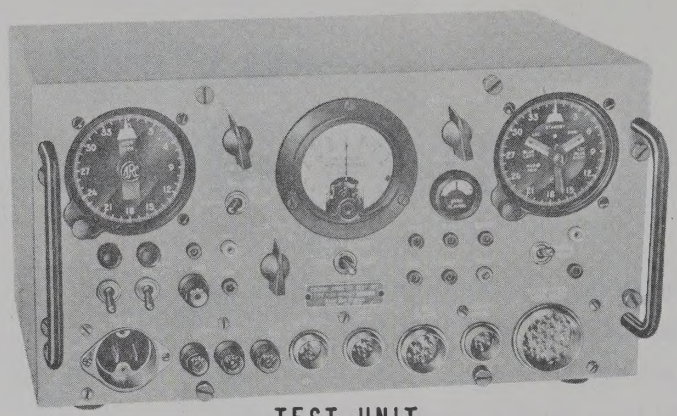

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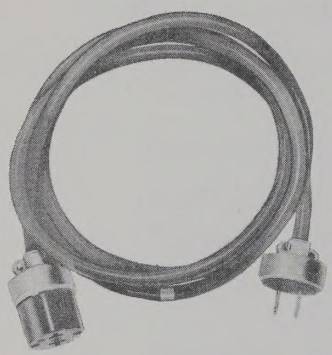
ARC TYPE H-17



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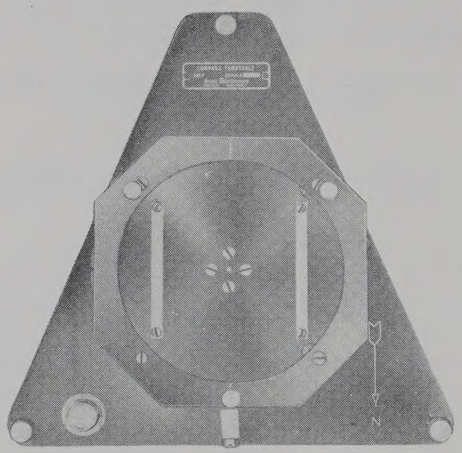

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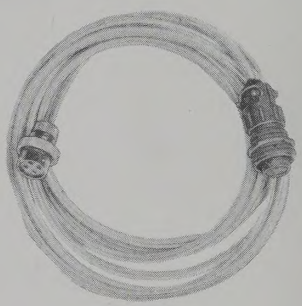

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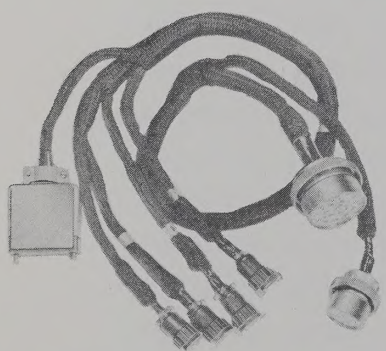
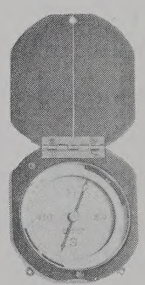


CABLE HARNESS ASSEMBLY
ARC-18870



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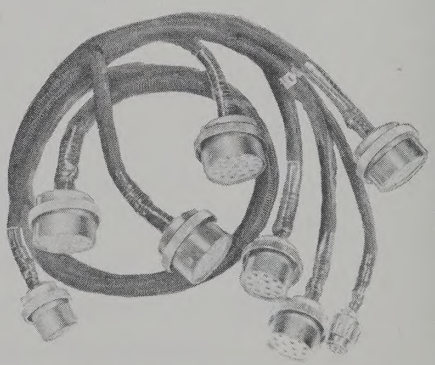


CABLE HARNESS ASSEMBLY
ARC-18876

Figure 1-1. ARC Type BTK-17 Bench Test Kit

SECTION I

GENERAL INFORMATION

1-1. PURPOSE.

1-2. The ARC Type BTK-17 Bench Test Kit (see figure 1-1) is designed to test and adjust the ARC Type CD-1 and Orion Type CD-1 Course Directors. The BTK-17 does not check the dynamotor, its associated filters, the Director Control Switch, the C-60 switch, and the mechanical operation of the Slaved Gyro.

1-3. COMPARISON OF ARC AND ORION TYPE CD-1 COURSE DIRECTORS.

1-4. Table 1-1 compares the names, and the type and part numbers of equivalent components of the ARC and Orion Type CD-1 Course Directors. When reference is made in this instruction book to a Type CD-1 component, the ARC component name and/or type number is used; however, the information given is also applicable to the comparable Orion component, unless noted otherwise.

1-5. COMPONENTS SUPPLIED.

1-6. The components supplied with the ARC Type BTK-17 Bench Test Kit are listed in table 1-2.

TABLE 1-2. COMPONENTS OF ARC TYPE BTK-17 BENCH TEST KIT

Quantity	*Name*	*Part No.*
1	Test Unit ARC Type H-17	18860
1	Compass Turntable	18440
1	Magnetic Compass	18433
1	Cable Assembly	14701
1	Cable Assembly	18878
1	Cable Harness Assembly	18870
1	Cable Harness Assembly	18876

TABLE 1-1. COMPARISON OF CD-1 COURSE DIRECTORS

ARC TYPE CD-1 COURSE DIRECTOR		*ORION TYPE CD-1 COURSE DIRECTOR*	
Name	*Type No.*	*Name*	*Part No.*
Compass Transmitter	CT-10	Compass Transmitter	511-400
Computer Amplifier	CA-10	Amplifier	511-600
Control Unit	C-60*	——	——
Course Indicator	IN-14*	——	——
Director Control	S-10*	Course Selector	511-300
Power Unit	P-12	Dynamotor	511-500
Dynamotor	D-10A		
Slaved Gyro	G-12	Slaved Gyro	511-700
Slaving Meter	IN-11	Slaving Meter	511-230

* In some CD-1 installations, the ARC Type C-60 Control Unit and the ARC Type IN-14 Course Indicator may be installed in place of the ARC Type S-10 Director Control.

1-7. FUNCTION OF COMPONENTS.

1-8. TEST UNIT. Test Unit ARC Type H-17 is the major component of the ARC Type BTK-17 Bench Test Kit. It provides operating voltages and includes the circuitry required to test the Type CD-1 components. All controls, instruments, test jacks, and connectors necessary for performing the tests are located on the Test Unit. Provisions are made to permit testing future Course Director systems which will require 115-volt, 400-cycle, single-phase power for operation.

1-9. COMPASS TURNTABLE AND MAGNETIC COMPASS. Compass Turntable ARC-18440 is used during the test of the Compass Transmitter. The turntable is supplied with Magnetic Compass ARC-18433, which is used for orientation of the turntable.

1-10. CABLE ASSEMBLY ARC-14701. Cable Assembly ARC-14701 is used to connect Test Unit ARC Type H-17 to a 115-volt, 60-cycle, single-phase primary power source. (At the present time, no cable assembly is supplied for connecting 115-volt, 400-cycle power.)

1-11. CABLE ASSEMBLY ARC-18878. Cable Assembly ARC-18878 is used to connect either the ARC or Orion Compass Transmitter to Test Unit ARC Type H-17.

1-12. CABLE HARNESS ASSEMBLIES. Cable Harness Assembly ARC-18870 is used to connect the Orion Type CD-1 components, except the Compass Transmitter, to Test Unit ARC Type H-17. Cable Harness Assembly ARC-18876 serves a similar purpose for the ARC Type CD-1 Course Director.

1-13. DESCRIPTION OF TEST UNIT.

1-14. GENERAL. Test Unit ARC Type H-17 contains an actual or simulated duplicate of each CD-1 component, except the dynamotor and associated filters, and the Computer Amplifier. A built-in power supply is used in place of the dynamotor and filters. Except for the S-10 and C-60 diode tests, and the IN-11 meter tests, a Computer Amplifier is required for all tests but is not included, since it is available normally as part of the CD-1 under test. The Computer Amplifier is tested first, and then is used as part of the test set-up to check out the other components of the CD-1.

1-15. Test Unit ARC Type H-17 requires approximately 45 watts at 115 volts, 60 cps. The 115-volt, 60-cycle circuit is protected by two 1-ampere fuses, the 115-volt, 400-cycle circuit by a 1/4-ampere fuse, and the high-voltage circuit of the power supply by a 1/16-ampere fuse. A set of spare fuses is located on the H-17 chassis.

1-16. The ARC Type H-17 is 8 inches high, 15 3/16 inches wide, and 10-3/16 inches deep. It weighs 12 pounds.

1-17. POWER SUPPLY. The ARC Type H-17 power supply operates from a 115-volt, 60-cycle, primary power source to furnish 27.5 volts ac and up to 60 ma at 280 volts dc. The primary power, controlled by the 60~ ON-OFF switch S108, is connected through J117, the two line fuses F103 and F104, through either R108 or the 60~ VOLTAGE switch S107, and through the INCR LV switch S106, to one of three taps on the primary of the power transformer T101. By switching S106 to one of the three available taps (105, 115, or 125 volts), a rough adjustment for line voltage differences can be made so that a high-voltage value closest to 280 volts can be obtained.

1-18. When the 60~ VOLTAGE switch is open (TEST position), a 125-ohm resistor, R108, is connected into the primary circuit of the power transformer to simulate the operating conditions that would be encountered if the primary power source voltage of an aircraft were to drop from a nominal 27.5 volts to 22 volts.

1-19. Tube heater voltage (27.5 volts ac) for the Computer Amplifier, is supplied from the low-voltage secondary winding of the power transformer. High voltage (280 volts dc) is provided by a full-wave bridge connected across the high-voltage secondary winding of T101. This circuit employs four type 1N93 crystal rectifiers (CR102, CR103, CR104, and CR105) and is designed to have approximately the same characteristics under load as the CD-1 power supply. The filter consists of two 40 μf capacitors, C101 and C102.

1-20. Lamp DS101 indicates that 115-volt, 400-cycle power is being used, and lamp DS102 indicates that 115-volt, 60-cycle power is being used.

1-21. METERING CIRCUITS. A gyro slaving meter, M101, and a deviation current meter, M102, are installed on the front panel of the H-17. M101 indicates, in milliamperes, the gyro slaving current from the Computer Amplifier gyro slaving amplifier. A 430-ohm resistor, R101, is connected in series with this meter to duplicate the impedance of the Slaved Gyro precession coil, through which the gyro slaving current passes in a CD-1 system. M102 is a zero-center microammeter which indicates the output of the Computer Amplifier's heading bridge. This output normally passes through the vertical needle movement of the aircraft's cross-pointer meter. A three-position switch, S103, is used to connect the meter for the desired range. Two ranges (30-0-30 and 150-0-150) are obtained by internal connections in the meter. The third position of the switch adds shunt and series resistance to the 150-0-150 terminals to extend the meter range on either side of zero to 450 microamperes.

1-22. DIODE TEST CIRCUIT. A low-voltage (0.5-volt) d-c rectifier is built into the ARC Type H-17 to

test the diodes of the ARC Type S-10 Director Control, or the ARC Type C-60 Control Unit. This circuit consists of a crystal diode rectifier, CR101, connected to the low-voltage a-c output of the H-17 power supply. The rectified output is filtered by R105 and C103, and attenuated by R106 and R107. The double-pole, double-throw DIODE TEST switch, S105, is used to connect the d-c test voltage to the crystal diode under test.

1-23. "STANDARD" ARC TYPE S-10 DIRECTOR CONTROL. The ARC Type H-17 includes an ARC Type S-10 Director Control which is used as part of the simulated CD-1 system to permit testing the Computer Amplifier.

Note

For clarity, the "standard" S-10 is referred to only as DIRECTOR CONTROL in this instruction book. Where the nomenclature "S-10 Director Control" appears, it refers to the CD-1 component.

1-24. "STANDARD" ARC TYPE G-12 SLAVED GYRO. The ARC Type G-12 Slaved Gyro is simulated in the ARC Type H-17 by Heading Synchro ARC-18780. This Heading Synchro is adjustable to permit simulation of the heading information supplied to a CD-1 system by the G-12.

Note

In future Course Director systems, the synchro in the ARC Type G-12 Slaved Gyro will be replaced by another unit which will include a different type of heading information synchro. Setting the H-17 HDG SYN switch to EXT will disconnect Heading Synchro ARC-18780 and permit the use of the new heading information synchro.

1-25. "STANDARD" ARC TYPE CT-10 COMPASS TRANSMITTER. The ARC Type CT-10 Compass Transmitter is simulated in the ARC Type H-17 by a Synchrotel that is locked at zero degrees. If desired, the Synchrotel can be disconnected and an external Compass Transmitter connected by setting the COMP XMTR switch to EXT.

SECTION II

INSTALLATION AND OPERATION

2-1. INTRODUCTION.

2-2. This section contains instructions for installing and operating the ARC Type BTK-17 Bench Test Kit to test and adjust either the ARC Type CD-1 or Orion Type CD-1 Course Director. Separate test procedures are outlined for the ARC Type CD-1 and Orion Type CD-1.

2-3. INSTALLATION.

2-4. No special preparation is required for installing the ARC Type BTK-17. All the required interconnecting cable assemblies are supplied prefabricated. The installation area should be large enough to accommodate the components of the BTK-17 and CD-1 under test. It should be chosen to permit convenient interconnection of the equipments and to facilitate the test procedures. The location selected for Compass Turntable ARC-18440 must be free of magnetic materials which, if moved, might affect the earth's magnetic field and thereby prevent proper orientation of the turntable. Its distance from the ARC Type H-17 is limited by Cable Assembly ARC-18878 which interconnects the Compass Transmitter under test and the H-17.

2-5. The ARC Type H-17, the major component of the ARC Type BTK-17, operates from a 115-volt, 60-cycle, single-phase power source when it is used to test a CD-1 system. A 115-volt, 400-cycle, single-phase power source is required when it is used to test Course Director systems which operate with 400-cycle power.

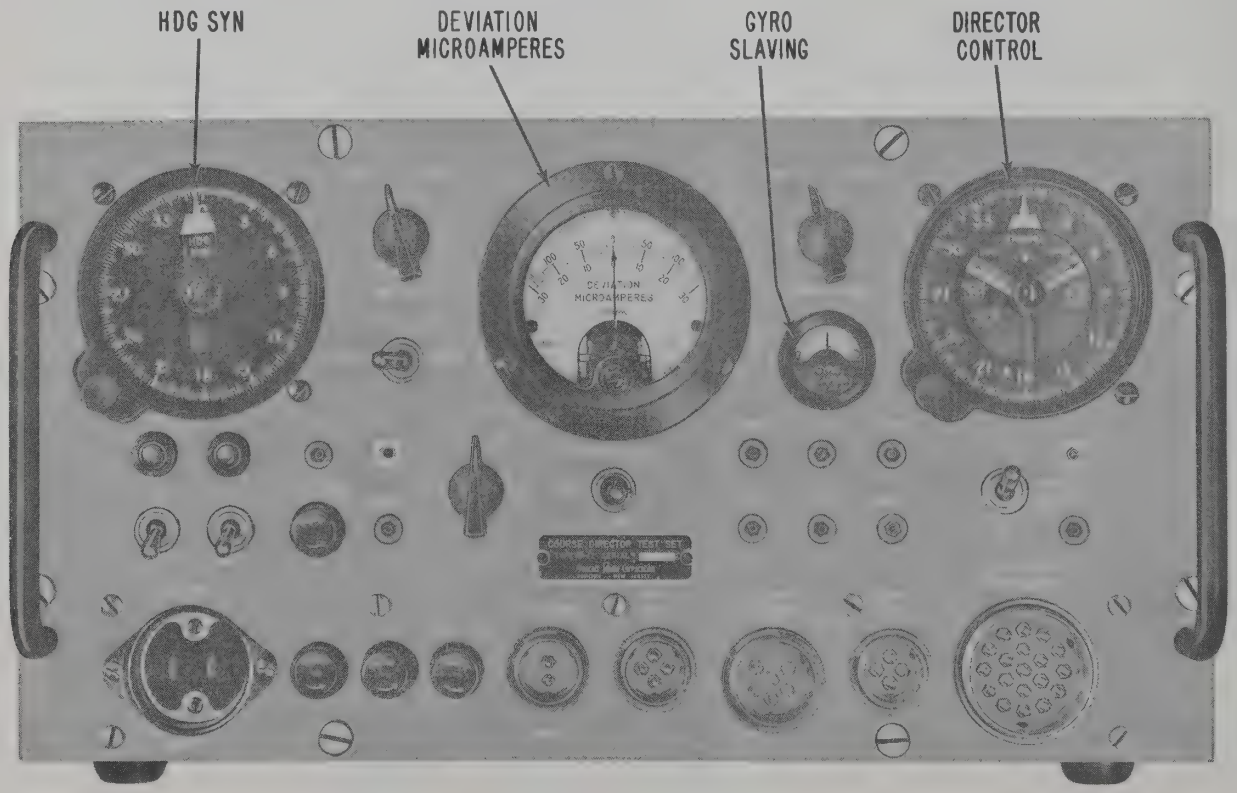


Figure 2-1. ARC Type H-17 Test Unit, Front Panel View

2-6. ADJUSTMENT PRIOR TO OPERATION.

2-7. For proper testing of the CD-1, the high-voltage output of the ARC Type H-17 power supply should be as close as possible to 280 volts dc. Since this value is affected by the primary source voltage, the ARC Type H-17 includes an adjustment to compensate for differing line voltage values. When adjustment is required, connect a d-c voltmeter to the HV and GND test jacks on the H-17. With a Computer Amplifier connected as a load, set the 60~ ON-OFF switch to ON, and turn the INCR LV switch to select the position which produces a reading as near as possible to 280 volts dc.

2-8. OPERATING CONTROLS.

2-9. All operating controls, as well as instruments, test jacks, and cable receptacles, required to test the ARC Type CD-1 or Orion Type CD-1 Course Director are located on the front panel of the ARC Type H-17. All active fuses, installed in extractor-type fuseholders, are also located on the front panel. These parts, shown in figure 2-1, are listed with their functions in table 2-1.

TABLE 2-1. OPERATING CONTROLS, INSTRUMENTS, TEST JACKS, CONNECTORS, AND FUSES

Panel Designation	*Function*
	CONTROLS
HDG SYN	In INT position, connects Heading Synchro Z101. In EXT position, disconnects Heading Synchro to permit use of external heading information synchro (to be used in future Course Director system; refer to paragraph 1-24).
COMP XMTR	In INT position, connects Synchrotel B101. In EXT position, disconnects Synchrotel to permit use of external Compass Transmitter.
60~ VOLTAGE	In NORM position, normal value of 115-volt, 60-cycle line voltage is applied. In TEST position, low- and high-voltage outputs are decreased about 20 per cent to simulate effect of low line voltage.
60~ ON-OFF	Controls application of 115-volt, 60-cycle primary power to ARC Type H-17. In ON position red indicator lamp lights.
400~ ON-OFF	Controls application of 115-volt, 400-cycle primary power to ARC Type H-17. In ON position red indicator lamp lights. (Not used for Type CD-1 Course Director.)
INCR LV	Compensates for different line voltage values (approximately 105, 115, or 125 volts) to bring H-17 high voltage output as near as possible to 280 volts dc.
METER SCALE	Selects desired microammeter range.
DIODE TEST	For checking crystal diodes of ARC Type S-10 or ARC Type C-60. Switch connects d-c test voltage to diode under test.
	TEST JACKS
HV, LV, and GND	For measuring d-c high voltage and d-c low-voltage outputs.
HDG	For measuring heading signal to computer section of Computer Amplifier.
OSC	For measuring oscillator voltage of Computer Amplifier.
COMP	For measuring compass signal feeding gyro slaving section of Computer Amplifier.
YEL and BLU	For checking and resetting indexing of synchros.
GND	Chassis ground connection.
DIODE TEST	For measuring d-c test voltage applied to crystal diodes of ARC Type S-10 or ARC Type C-60.
	CONNECTORS
115V 60~ INPUT	Input for 115-volt, 60-cycle primary power.
115V 400~ INPUT	Input for 115-volt, 400-cycle primary power. (Not used for Type CD-1 Course Director.)
HDG SYN	For external heading information synchro. (Not used for Type CD-1 Course Director; refer to paragraph 1-24.)
SYN-DIODES	For synchros and diodes checks.
COMP XMTR	For external Compass Transmitter.
COMPUTER AMPLIFIER	For Computer Amplifier.

TABLE 2-1. OPERATING CONTROLS, INSTRUMENTS, TEST JACKS, CONNECTORS, AND FUSES—Continued

Panel Designation	*Function*
	INSTRUMENTS
HDG SYN	Heading Synchro which electrically simulates the ARC Type G-12 Slaved Gyro.
DEVIATION MICROAMPERES	Indicates output current of Computer Amplifier's heading bridge. (This output normally passes through vertical needle movement of cross-pointer meter.)
GYRO SLAVING	Indicates output current of Computer Amplifier gyro slaving bridge. This current passes through a dummy precession coil load in the H-17.
DIRECTOR CONTROL	ARC Type S-10 Director Control.
	FUSES
HV 1/16 A	Protects high-voltage circuit. (Spare on chassis.)
60~ 1A	Protect 115-volt, 60-cycle primary power circuit. (Spares on chassis.)
400~ 1/4 A	Protects 115-volt, 400-cycle primary power circuit. (Spare on chassis.)

2-10. TEST AND ADJUSTMENT OF ARC TYPE CD-1 COURSE DIRECTOR.

2-11. INTRODUCTION. Procedures for testing and adjusting the components of the ARC Type CD-1 Course Director are outlined in paragraphs 2-12 through 2-24. Detailed component trouble-shooting information for the ARC Type CD-1 is not provided; such information is included in the ARC Type CD-1 instruction book. A bench test interconnection diagram is shown in figure 2-2. Separate procedures for the Orion Type CD-1 Course Director are given in paragraphs 2-25 through 2-37. Except for first testing the Computer Amplifier prior to performing any other tests (except diode tests and IN-11 meter tests), the sequence of the tests as given need not be followed.

Note

The test limits apply to the ARC Type CD-1 components, and are based on a high-voltage output from the ARC Type H-17 power supply of 280 volts dc. Test limits acceptable in the field may vary from those listed, since the high-voltage output is dependent upon the value of the primary power source. Be sure to compensate for such differences, as described in paragraph 2-14, and judge the test limits noted in the field accordingly.

2-12. ARC TYPE CA-10 COMPUTER AMPLIFIER TESTS.

2-13. GENERAL. Procedures for testing the ARC Type CA-10 Computer Amplifier are outlined in paragraphs 2-14 through 2-18. These tests must be conducted before any other CD-1 component test (except crystal diode and IN-11 meter tests) to make sure that the Computer Amplifier used in the bench test set-up is operating properly. The Computer Amplifier tests consist of an oscillator test, a gyro slaving amplifier test, a heading bridge test, and a heading computer test.

Note

The test limits given for the ARC Type CA-10 Computer Amplifier are based on the wiring and component parts as shown on issue H, or later, of the wiring diagram (ARC Drawing No. 20051). The issue used may be determined by the letter stamped on the rear of the chassis. Units of previous issue either should be returned to the factory for modification or rewired in the field. Copies of the latest schematic and wiring diagrams are available upon request.

2-14. PRELIMINARY PROCEDURE.

Step 1. Interconnect the ARC Type CA-10 Computer Amplifier and ARC Type H-17 Test Unit with Cable Harness Assembly ARC-18876. (See figure 2-2.) *Do not connect any other CD-1 component.*

Step 2. Connect the 115-volt, 60-cycle primary power source to the H-17 using Cable Assembly ARC-14701.

Step 3. Set H-17 switches as follows: HDG SYN to INT, COMP XMTR to INT, 60~ VOLTAGE to NORM, METER SCALE to 450, and 60~ ON-OFF to ON. Allow equipment to warm up for 5 to 10 minutes.

Step 4. Connect a d-c voltmeter (300-volt range) to the HV and GND test jacks. Using the INCR LV switch, set the H-17 high voltage as near as possible to 280 volts dc. (Leave the d-c voltmeter connected to permit monitoring the high voltage during tests.)

Note

The H-17 checks Computer Amplifiers only for 28-volt operation; continuity of 14-volt heater wiring may be checked with an ohmmeter.

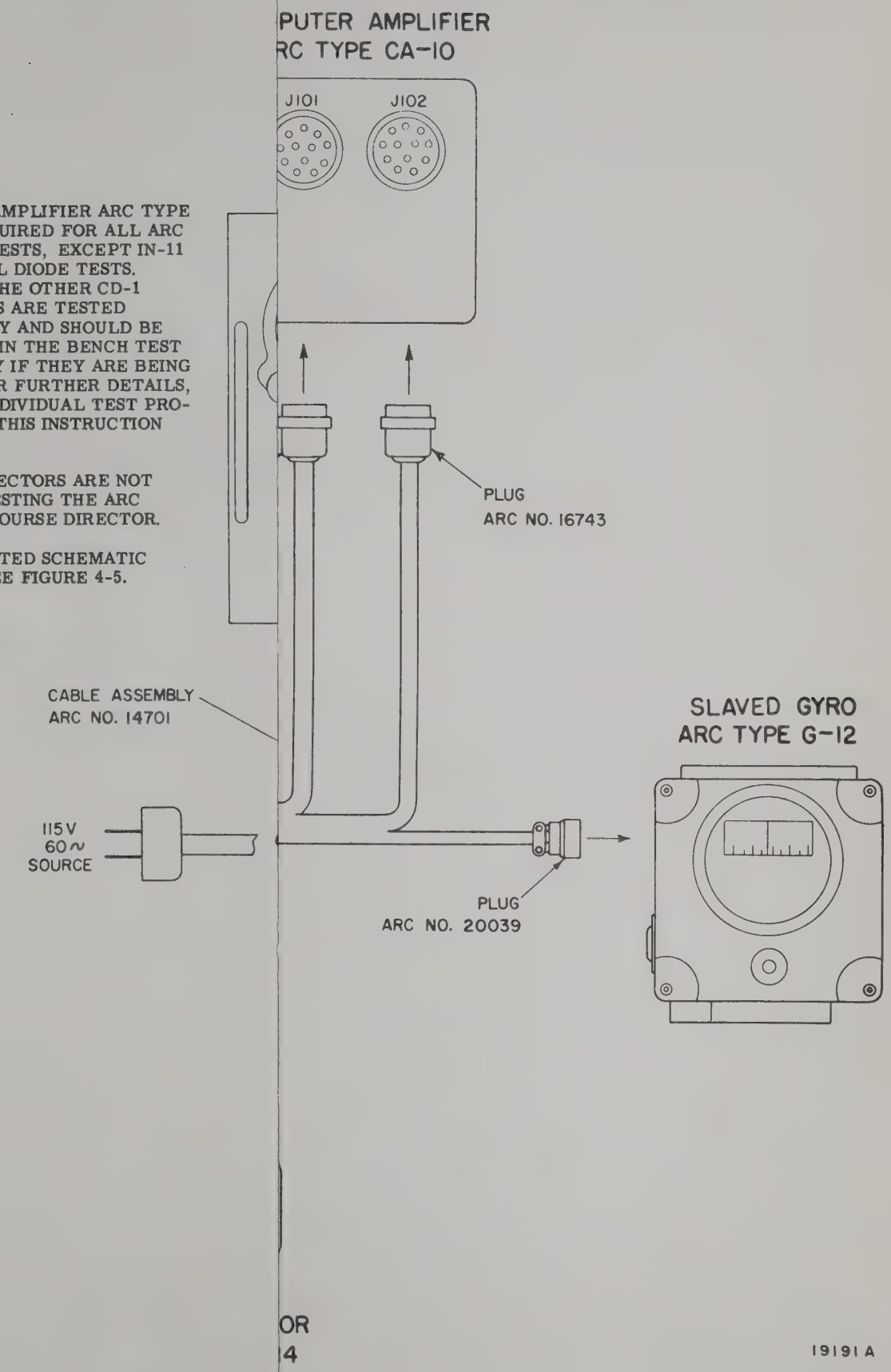
2-15. OSCILLATOR TEST.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the OSC and GND test jacks.

Step 2. Measure the oscillator output, which should be between 28 and 35 volts.

Step 3. Remove voltmeter. Set COMP XMTR to EXT.

Step 4. Connect the output of an audio oscillator, such as Hewlett-Packard Model 200B, to the COMP and GND test jacks.



NOTES:

1. COMPUTER AMPLIFIER ARC TYPE CA-10 IS REQUIRED FOR ALL ARC TYPE CD-1 TESTS, EXCEPT IN-11 AND CRYSTAL DIODE TESTS. HOWEVER, THE OTHER CD-1 COMPONENTS ARE TESTED INDIVIDUALLY AND SHOULD BE CONNECTED IN THE BENCH TEST SET-UP ONLY IF THEY ARE BEING TESTED FOR FURTHER DETAILS, REFER TO INDIVIDUAL TEST PROCEDURES IN THIS INSTRUCTION BOOK.
2. THESE CONNECTORS ARE NOT USED FOR TESTING THE ARC TYPE CD-1 COURSE DIRECTOR.
3. FOR ASSOCIATED SCHEMATIC DIAGRAM, SEE FIGURE 4-5.

Figure 2-2. Bench Test Intercabling Diagram for ARC Type BTK-17 Bench Test Kit and ARC Type CD-1 Course Director

TABLE 2-1. OPERATING CONTROLS, INSTRUMENTS, TEST JACKS, CONNECTORS, AND FUSES—Continued

Panel Designation	*Function*
INSTRUMENTS	
HDG SYN	Heading Synchro which electrically simulates the ARC Type G-12 Slaved Gyro.
DEVIATION MICROAMPERES	Indicates output current of Computer Amplifier's heading bridge. (This output normally passes through vertical needle movement of cross-pointer meter.)
GYRO SLAVING	Indicates output current of Computer Amplifier gyro slaving bridge. This current passes through a dummy precession coil load in the H-17.
DIRECTOR CONTROL	ARC Type S-10 Director Control.
FUSES	
HV 1/16 A	Protects high-voltage circuit. (Spare on chassis.)
60~ 1A	Protect 115-volt, 60-cycle primary power circuit. (Spares on chassis.)
400~ 1/4 A	Protects 115-volt, 400-cycle primary power circuit. (Spare on chassis.)

2-10. TEST AND ADJUSTMENT OF ARC TYPE CD-1 COURSE DIRECTOR.

2-11. INTRODUCTION. Procedures for testing and adjusting the components of the ARC Type CD-1 Course Director are outlined in paragraphs 2-12 through 2-24. Detailed component trouble-shooting information for the ARC Type CD-1 is not provided; such information is included in the ARC Type CD-1 instruction book. A bench test interconnection diagram is shown in figure 2-2. Separate procedures for the Orion Type CD-1 Course Director are given in paragraphs 2-25 through 2-37. Except for first testing the Computer Amplifier prior to performing any other tests (except diode tests and IN-11 meter tests), the sequence of the tests as given need not be followed.

Note

The test limits apply to the ARC Type CD-1 components, and are based on a high-voltage output from the ARC Type H-17 power supply of 280 volts dc. Test limits acceptable in the field may vary from those listed, since the high-voltage output is dependent upon the value of the primary power source. Be sure to compensate for such differences, as described in paragraph 2-14, and judge the test limits noted in the field accordingly.

2-12. ARC TYPE CA-10 COMPUTER AMPLIFIER TESTS.

2-13. GENERAL. Procedures for testing the ARC Type CA-10 Computer Amplifier are outlined in paragraphs 2-14 through 2-18. These tests must be conducted before any other CD-1 component test (except crystal diode and IN-11 meter tests) to make sure that the Computer Amplifier used in the bench test set-up is operating properly. The Computer Amplifier tests consist of an oscillator test, a gyro slaving amplifier test, a heading bridge test, and a heading computer test.

Note

The test limits given for the ARC Type CA-10 Computer Amplifier are based on the wiring and component parts as shown on issue H, or later, of the wiring diagram (ARC Drawing No. 20051). The issue used may be determined by the letter stamped on the rear of the chassis. Units of previous issue either should be returned to the factory for modification or rewired in the field. Copies of the latest schematic and wiring diagrams are available upon request.

2-14. PRELIMINARY PROCEDURE.

Step 1. Interconnect the ARC Type CA-10 Computer Amplifier and ARC Type H-17 Test Unit with Cable Harness Assembly ARC-18876. (See figure 2-2.) *Do not connect any other CD-1 component.*

Step 2. Connect the 115-volt, 60-cycle primary power source to the H-17 using Cable Assembly ARC-14701.

Step 3. Set H-17 switches as follows: HDG SYN to INT, COMP XMTR to INT, 60~ VOLTAGE to NORM, METER SCALE to 450, and 60~ ON-OFF to ON. Allow equipment to warm up for 5 to 10 minutes.

Step 4. Connect a d-c voltmeter (300-volt range) to the HV and GND test jacks. Using the INCR LV switch, set the H-17 high voltage as near as possible to 280 volts dc. (Leave the d-c voltmeter connected to permit monitoring the high voltage during tests.)

Note

The H-17 checks Computer Amplifiers only for 28-volt operation; continuity of 14-volt heater wiring may be checked with an ohmmeter.

2-15. OSCILLATOR TEST.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the OSC and GND test jacks.

Step 2. Measure the oscillator output, which should be between 28 and 35 volts.

Step 3. Remove voltmeter. Set COMP XMTR to EXT.

Step 4. Connect the output of an audio oscillator, such as Hewlett-Packard Model 200B, to the COMP and GND test jacks.

NOTES:

1. COMPUTER AMPLIFIER ARC TYPE CA-10 IS REQUIRED FOR ALL ARC TYPE CD-1 TESTS, EXCEPT IN-11 AND CRYSTAL DIODE TESTS. HOWEVER, THE OTHER CD-1 COMPONENTS ARE TESTED INDIVIDUALLY AND SHOULD BE CONNECTED IN THE BENCH TEST SET-UP ONLY IF THEY ARE BEING TESTED FOR FURTHER DETAILS, REFER TO INDIVIDUAL TEST PROCEDURES IN THIS INSTRUCTION BOOK.
2. THESE CONNECTORS ARE NOT USED FOR TESTING THE ARC TYPE CD-1 COURSE DIRECTOR.
3. FOR ASSOCIATED SCHEMATIC DIAGRAM, SEE FIGURE 4-5.

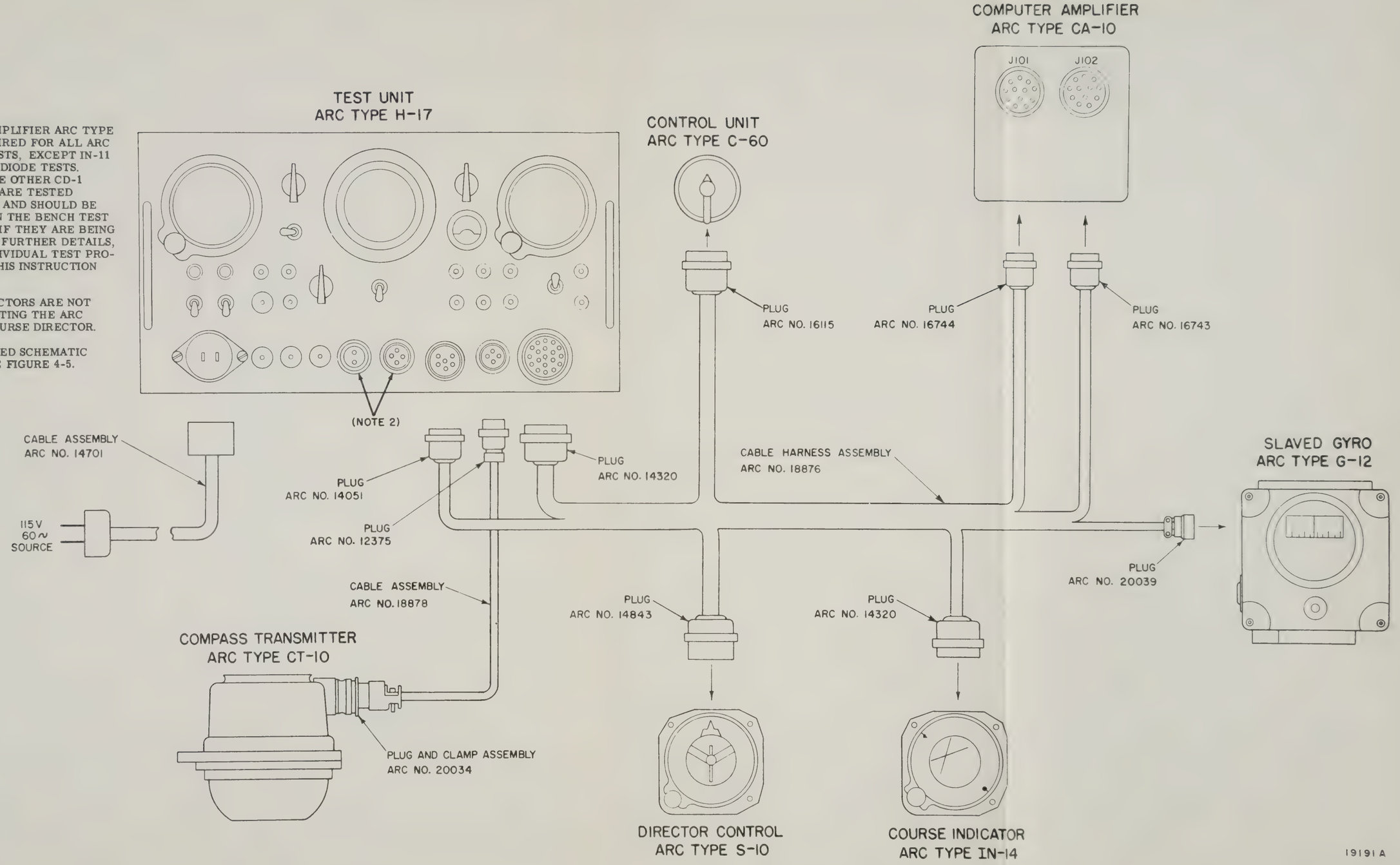


Figure 2-2. Bench Test Intercabling Diagram for ARC Type BTK-17 Bench Test Kit and ARC Type CD-1 Course Director

Step 5. Adjust the audio oscillator output at approximately 1350 cps to about 2 volts.

Step 6. Observing the GYRO SLAVING meter, carefully vary the frequency of the audio oscillator in the vicinity of 1350 cps. A region will be observed where the GYRO SLAVING meter will follow the beat frequency; at the center of this region, the internal and external oscillators are synchronized. At the synchronization point, the frequency should be between 1250 and 1450 cps. Disconnect the audio oscillator and reset COMP XMTR to INT.

2-16. GYRO SLAVING AMPLIFIER TEST.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. Short the COMP test jack to ground, as convenient. Read the gyro slaving current on the GYRO SLAVING meter and compare with the limit values listed in table 2-2. (A negative current value refers to a leftward needle deflection; a positive value to a rightward needle deflection.) Remove the COMP test jack short.

TABLE 2-2. ARC GYRO SLAVING AMPLIFIER TEST LIMITS

HDG SYN Setting (degrees)	*Gyro Slaving Current (milliamperes)*
0	−0.5 to +0.5
10*	−6.0 to −11.0
350*	+6.0 to +11.0

* The magnitude of the measurements at 10 degrees and 350 degrees must be within 2.0 ma of each other.

Step 3. Set the HDG SYN instrument to 10 and to 350 degrees, and compare the respective gyro slaving current measurements read on the GYRO SLAVING meter with the limit values listed in table 2-2.

Step 4. Measure the gyro slaving current at HDG SYN positions of 2 and 358 degrees. These readings must be greater than the currents obtained at 10 degrees and 350 degrees, respectively.

2-17. HEADING BRIDGE TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to MAG HDG.

Step 4. Connect the Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks to indicate the heading signal, and set the DIRECTOR CONTROL pointer as accurately as possible to zero degrees to null the heading signal.

Step 5. Set the METER SCALE switch to 30 and read the deviation current on the DEVIATION MICROAMPERES meter. If this reading is not 0 (±0.5) μa, adjust R112 in the Computer Amplifier to obtain such a reading.

Step 6. Set the METER SCALE switch to 150, and adjusting the DIRECTOR CONTROL pointer knob, note the degree-settings required to produce −150 μa and +150 μa deviation current. For a reading of −150 μa, the pointer should indicate between limits of 342 and 347 degrees. For a reading of +150 μa, it should indicate between limits of 13 and 18 degrees. The sum of the two settings should be between limits of 358.5 and 361.5 degrees. If these values are not between the limits specified, proceed with paragraph 2-18 and repeat Step 6 of this procedure.

2-18. HEADING COMPUTER TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to COMP and GND test jacks.

Step 2. Set H-17 HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT.

Step 4. Set the DIRECTOR CONTROL pointer knob to each of the angles listed in table 2-3, and for each setting, set METER SCALE switch as required; then read and record the deviation current on the DEVIATION MICROAMPERES meter after it has become stabilized. (The cross-wind compensation circuit in the Computer Amplifier makes the meter action very slow.) For the zero-degree setting, connect a Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks, and set the DIRECTOR CONTROL pointer to null the heading signal. The deviation current readings must be within the limits given in table 2-3. If they are not, adjust the heading computer as described in Step 5 of this procedure.

Note

If desired, the time required for the deviation current reading to stabilize may be decreased by replacing C109 (4 μf) of the Computer Amplifier with a 0.1-μf capacitor. *After the heading computer adjustments are completed, reinstall the original C109.*

TABLE 2-3. ARC HEADING COMPUTER TEST LIMITS

DIRECTOR CONTROL Setting (degrees)	*Deviation Current (microamperes)*
0	−1.5 to +1.5
5	+5 to +10
18*	+25 to +30
90	+300 to +345
270	−315 to −390
342*	−25 to −30
355	−5 to −10

* The magnitudes of the 18-degree and 342-degree currents must be within 5 μa of each other.

Step 5. If the deviation currents are not within the limits listed in table 2-3, proceed as follows:

a. Adjust R126 of the Computer Amplifier for equal and opposite deviation current at DIRECTOR CONTROL settings of 18 degrees and 342 degrees.

b. Adjust R117 of the Computer Amplifier to make the 18-degree current as close as possible to +27 microamperes.

c. Readjust R126 and R117 as required to balance the 18-degree and 342-degree currents within 2 microamperes, and as close as possible to +27 microamperes and −27 microamperes, respectively.

d. Set the METER SCALE switch to 450. Set the DIRECTOR CONTROL to 90 degrees and adjust R134 of the Computer Amplifier to make the deviation current as close as possible to +325 microamperes. (This will be read on the DEVIATION MICROAMPERES meter 150-microampere scale as 108 microamperes.)

e. Repeat *a.* and *b.* of this step and lock all potentiometers, taking care not to disturb their settings.

f. Reinstall the original C109 (4 μf) if it was replaced temporarily by a 0.1-μf capacitor.

Step 6. With the DIRECTOR CONTROL set to 18 degrees, note the change in deviation current when the 60~ VOLTAGE switch is thrown to TEST. The current should not increase, nor should it decrease more than 7 μa. Reset the 60~ VOLTAGE switch to NORM.

Step 7. Set the METER SCALE switch to 150, the DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT and its pointer to 18 degrees, and the HDG SYN switch to EXT.

Step 8. About 1 minute after performing Step 7, set the HDG SYN switch to INT, and disregarding the needle overswing due to the inertia of the meter movement, note the initial and stabilized values of deviation current indicated on the DEVIATION MICROAMPERES meter. Calculate 63 per cent of the difference between the two readings. Subtract the result from the initial (maximum) current reading. Reset the HDG SYN switch to EXT. Again after about 1 minute, reset the HDG SYN switch to INT and using a stop watch, or equivalent, measure the "time constant" as the time required for the deviation current to decay to the calculated value.

Step 9. Repeat Steps 7 and 8 at a DIRECTOR CONTROL setting of 342 degrees.

Step 10. At either DIRECTOR CONTROL setting, the "time constant" must be between the limits of 7 and 13 seconds. If not, check the value and condition of C109, R123, and R124 of the Computer Amplifier.

2-19. ARC TYPE G-12 SLAVED GYRO SYNCHRO TEST.

Step 1. Follow the preliminary procedure outlined in paragraph 2-14, except also connect the ARC Type G-12 Slaved Gyro to be tested (see figure 2-2). Do not connect any CD-1 components other than the Computer Amplifier and Slaved Gyro.

Step 2. Connect a Simpson Model 260 multimeter, or equivalent, set to read a-c volts, to the OSC and GND test jacks, and record the oscillator voltage indicated.

Step 3. Connect the Simpson Model 260 to the YEL and BLU test jacks for an indication of the YEL-to-BLU voltage.

CAUTION

Use a Simpson Model 260 multimeter, or equivalent. Do not use a meter requiring connection to the power line as this may add shunt capacitance to ground.

Step 4. Adjust the Slaved Gyro pointer, in the vicinity of zero degrees, to obtain a null reading of the YEL-to-BLU voltage; this should be less than 0.1 volt.

Step 5. Connect the Simpson Model 260 to the YEL and OSC test jacks.

Step 6. Read the YEL-to-OSC voltage. If the Slaved Gyro synchro is indexed properly, the YEL-to-OSC voltage will be about 1.4 times greater than the OSC-to-GND voltage measured in Step 2 of this procedure, and the Slaved Gyro pointer will be set at 0 (±0.5) degree. Improper indexing is indicated if the YEL-to-OSC voltage is about 0.6 of the OSC-to-GND voltage.

2-20. ARC TYPE S-10 DIRECTOR CONTROL SYNCHRO TEST.

Step 1. Follow the preliminary procedure outlined in paragraph 2-14, except also connect the ARC Type S-10 Director Control to be tested (see figure 2-2). Do not connect any CD-1 components other than the Computer Amplifier and S-10 Director Control.

Step 2. Connect a Simpson Model 260 multimeter, or equivalent, set to read a-c volts, to the OSC and GND test jacks, and record the oscillator voltage indicated.

Step 3. Connect the Simpson Model 260 to the YEL and BLU test jacks for an indication of the YEL-to-BLU voltage.

CAUTION

Use a Simpson Model 260 multimeter, or equivalent. Do not use a meter requiring connection to the power line as this may add shunt capacitance to ground.

Step 4. Adjust the S-10 Director Control under test, in the vicinity of 270 degrees, to obtain a null reading of the YEL-to-BLU voltage; this should be less than 0.1 volt.

Step 5. Connect the Simpson Model 260 to the YEL and OSC test jacks.

Step 6. Read the YEL-to-OSC voltage. If the synchro of the S-10 Director Control under test is indexed properly, the YEL-to-OSC voltage will be about 1.4 times greater than the OSC-to-GND voltage measured in Step 2 of this procedure, and the S-10 Director Control pointer will be set at 270 ($\pm$0.5) degrees. Improper indexing is indicated if the YEL-to-OSC voltage is about 0.6 of the OSC-to-GND voltage.

2-21. ARC TYPE IN-14 INDICATOR SYNCHRO TEST. To test the synchro in the ARC Type IN-14 Indicator, follow the procedure described in paragraph 2-20 for the ARC Type S-10 Director Control.

2-22. ARC TYPE S-10 DIRECTOR CONTROL AND ARC TYPE C-60 CONTROL UNIT CRYSTAL DIODE TEST.

Step 1. Interconnect the ARC Type S-10 Director Control, or ARC Type C-60 Control Unit, and the ARC Type H-17 using Cable Harness Assembly ARC-18876. (See figure 2-2.) (The Computer Amplifier is not required.) Set the S-10 Director Control switch to STANDBY, or the C-60 switch to LOC ONLY, as applicable.

Step 2. Connect the 115-volt, 60-cycle primary power source to the H-17 using Cable Assembly ARC-14701, and set the 60~ ON-OFF switch to ON.

Step 3. Connect a Hewlett-Packard Model 410B voltmeter, or equivalent, to the DIODE TEST jacks, and set the INCR LV switch to obtain an output as close as possible to 0.5 volt dc.

Step 4. Set the S-10 Director Control switch to OMNI LOC BLUE RIGHT, or the C-60 switch to CD LOC BLUE RIGHT, as applicable. Read the voltmeter for positions 1 and 2 of the DIODE TEST switch. In either position, a reading between the limits of 0.27 to 0.36 volt should be observed. The reading will be lower or higher if the initial voltage setting was lower or higher than 0.5 volt.

2-23. ARC TYPE CT-10 COMPASS TRANSMITTER TEST.

Step 1. Locate Compass Turntable ARC-18440 in an area where the earth's magnetic field will not be affected appreciably by the movement of magnetic materials in the locality.

Step 2. Install Magnetic Compass ARC-18433 within the turntable guide bars so that the 180-degree line of the compass is aligned with the 180-degree marking of the turntable. (See figure 2-3.)

Step 3. Level the turntable by means of the leveling screws and level-glass.

Step 4. Set the turntable so that the 0 position is engaged by the detent, and rotate the entire Compass Turntable until the compass needle points to magnetic north.

Note

No magnets or magnetic material, such as test carts, chairs, or objects worn by the operator, which may be subject to movement, should be near the Compass Turntable during this adjustment. If in doubt as to the magnetic influence of any objects in the vicinity of the compass, move the objects and recheck the compass indication.

Step 5. If necessary, relevel the turntable; also, recheck the compass setting.

Step 6. Carefully remove Magnetic Compass ARC-18433 and secure the Compass Transmitter (without compensator) to the turntable with the three nonmagnetic, knurled thumb-screws provided. The two fiducial lines on the Compass Transmitter must be in alignment with the two fiducial lines on the Compass Turntable, with the FORE and AFT arrow pointing in the direction designated as north on the Compass Turntable.

Step 7. Interconnect the Compass Transmitter and the H-17 with Cable Assembly ARC-18878 (see figure 2-2) leaving at least 1 foot of slack so that the Compass Transmitter can be rotated without pulling the cable taut and disturbing the turntable position.

Step 8. Interconnect the tested CD-1 Computer Amplifier and the H-17 with Cable Harness Assembly ARC-18876. Do not connect any CD-1 components other than the Computer Amplifier and Compass Transmitter.

Step 9. Connect the 115-volt, 60-cycle primary power source to the H-17 using Cable Assembly ARC-14701.

Step 10. Set H-17 switches as follows: HDG SYN to INT, COMP XMTR to EXT, 60~ VOLTAGE to NORM, METER SCALE to 450, and 60~ ON-OFF to ON. (It is not necessary to set the high-voltage output of the H-17 as was done for the Computer Amplifier tests.)

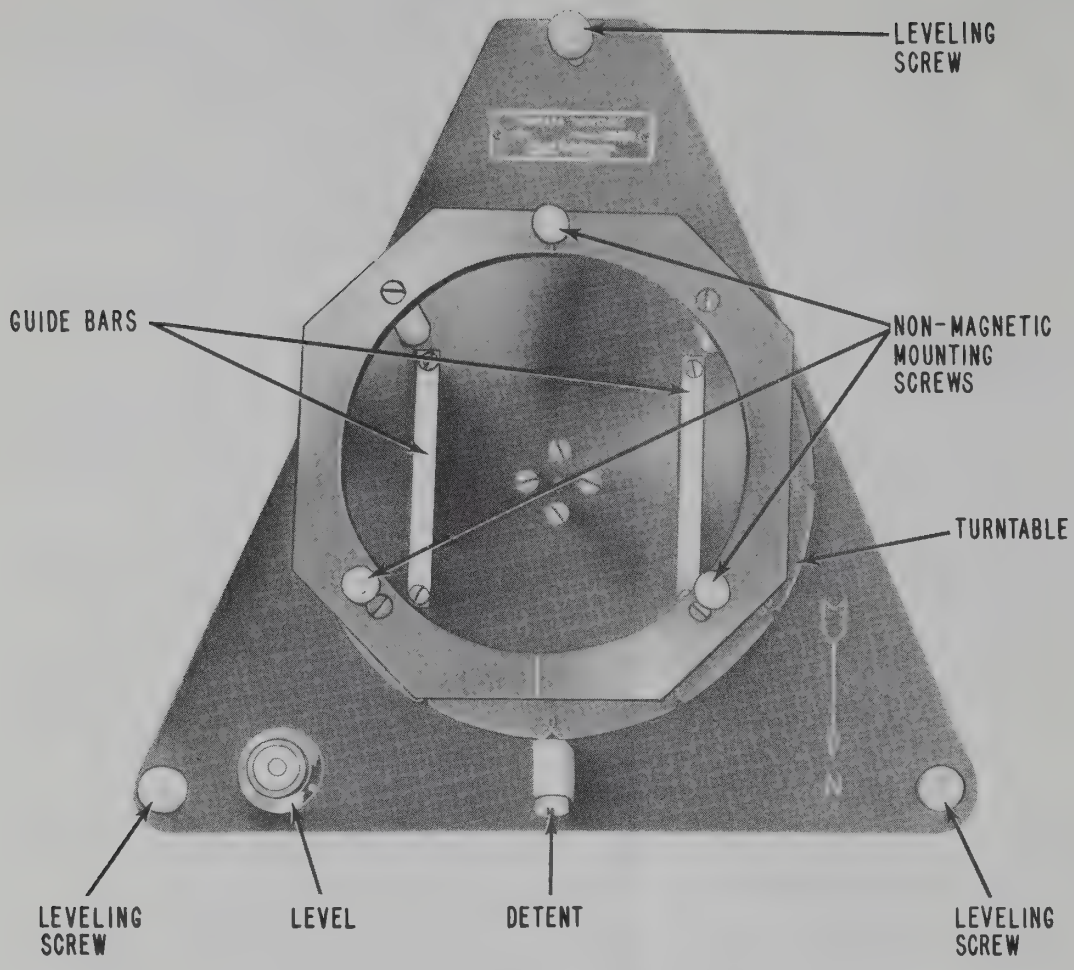


Figure 2-3. Compass Turntable ARC-18440

Step 11. Set the DIRECTOR CONTROL to 0. Set the HDG SYN instrument to produce 0 (±1) ma gyro slaving current and record HDG SYN instrument reading. Observe the direction toward which the HDG SYN control must be rotated to center the GYRO SLAVING meter. For correct sense, if the GYRO SLAVING needle is to the right of center, rotating the HDG SYN control toward the right should center the needle, and vice versa.

Step 12. Lightly finger-tap the top of the Compass Transmitter until the GYRO SLAVING meter settles to a constant reading. (A slaving current flutter of 1 or 2 ma during tapping is normal.) In order to observe whether the meter has settled to a constant reading, keep the GYRO SLAVING meter reading below 6 ma by adjusting the HDG SYN instrument.

Step 13. Reset the HDG SYN instrument to produce 0 (±1) ma gyro slaving current and record the HDG SYN instrument reading.

Step 14. Carefully set the turntable to each 30-degree detent position, progressing clockwise, and repeat Steps 11, 12, and 13 (except the sense test of Step 11) for each point, recording the HDG SYN instrument readings before and after tapping. Repeat, progressing counterclockwise, for each 30-degree detent position. The difference in the HDG SYN instrument readings before and after tapping, for any one turntable setting, must not exceed 3/4 of a degree. After tapping, the reading of the HDG SYN instrument must agree with the related Compass Turntable setting within 3 degrees; however, errors of 4 degrees are acceptable if the spread between the minimum and maximum error is not greater than 5 degrees.

2-24. ARC TYPE IN-11 SLAVING METER TEST.

Step 1. Connect the 115-volt, 60-cycle primary power to the H-17 using Cable Assembly ARC-14701, and set the 60~ ON-OFF switch to ON.

Step 2. Connect a d-c voltmeter to the DIODE TEST jacks, and set the INCR LV switch to obtain an output as close as possible to 0.5 volt dc.

Step 3. Disconnect the voltmeter and connect the IN-11 to the DIODE TEST jacks (+ to +, − to −). The IN-11 needle should deflect approximately ⅓-full scale to the right.

Step 4. Reverse the connections to the IN-11. The needle should deflect approximately 1/3-full scale to the left.

2-25. TEST AND ADJUSTMENT OF ORION TYPE CD-1 COURSE DIRECTOR.

2-26. INTRODUCTION. Procedures for testing and adjusting the components of the Orion Type CD-1 Course Director are outlined in paragraphs 2-27 through 2-37. Detailed component trouble-shooting information is not included. A bench test interconnection diagram is shown in figure 2-4. Separate procedures for the ARC Type CD-1 Course Director are given in paragraphs 2-10 through 2-24. Because of the similarity of some of the test procedures, in certain instances reference is made to the appropriate ARC CD-1 test for detailed test instructions, but differences in test limits and other results are noted as required. As in the case of the ARC Type CD-1, except for diode tests and the slaving meter test, the Orion Amplifier should be tested first, since it is required to perform the other tests; also, be sure to adjust for line voltage differences as described in paragraph 2-29.

2-27. ORION AMPLIFIER TESTS.

2-28. GENERAL. Except for test limits, the testing of the Orion Amplifier is quite similar to the ARC Type CA-10 Computer Amplifier tests. The test limits listed for the Orion Amplifier do not necessarily reflect the values obtained in actual operation of the Orion CD-1, since these figures are based on ARC Type H-17 test conditions. The ARC Type CD-1 and the H-17 contain synchros which deliver more output than the Orion synchros.

2-29. PRELIMINARY PROCEDURE.

CAUTION

Before connecting the Orion Amplifier, turn and lock the 12/24-volt switch in the 24-volt position.

Step 1. Interconnect the Orion Amplifier and ARC Type H-17 Test Unit with Cable Harness Assembly ARC-18870. (See figure 2-4.) *Do not connect any other Orion Type CD-1 component.*

Step 2. Connect the 115-volt, 60-cycle primary power source to H-17 using Cable Assembly ARC-14701.

Step 3. Set H-17 switches as follows: HDG SYN to INT, COMP XMTR to INT, 60~ VOLTAGE to NORM, METER SCALE to 450, and 60~ ON-OFF to ON. Allow equipment to warm up for 5 to 10 minutes.

Step 4. Connect a d-c voltmeter (300-volt range) to the HV and GND test jacks. Using the INCR LV switch, set the H-17 high voltage as near as possible to 280 volts dc. (Leave the d-c voltmeter connected to permit monitoring the high voltage during tests.)

Note

The H-17 checks Orion Amplifiers only for 28-volt operation; continuity of 14-volt heater wiring may be checked with an ohmmeter.

2-30. OSCILLATOR TEST.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the OSC and GND test jacks.

Step 2. Measure the oscillator output, which should be between 30 and 37 volts.

Step 3. Remove voltmeter. Set COMP XMTR to EXT.

Step 4. Connect the output of an audio oscillator, such as Hewlett-Packard Model 200B, to the COMP and GND test jacks.

Step 5. Adjust the audio oscillator output at approximately 1350 cps to about 2 volts.

Step 6. Observing the GYRO SLAVING meter, carefully vary the frequency of the audio oscillator in the vicinity of 1350 cps. A region will be observed where the GYRO SLAVING meter will follow the beat frequency; at the center of this region, the internal and oscillators are synchronized. At the synchronization point, the frequency should be between 1250 and 1450 cps. Disconnect the audio oscillator and reset the COMP XMTR to INT.

2-31. GYRO SLAVING AMPLIFIER TEST.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. Short the COMP test jack to ground, as convenient. Read the gyro slaving current on the GYRO SLAVING meter and compare with the limit values listed in table 2-4. (A negative current value refers to a leftward needle deflection; a positive value to a rightward needle deflection.) Remove the COMP test jack short.

Step 3. Set the HDG SYN instrument to 2 and to 358 degrees, and compare the respective gyro slaving current measurements read on the GYRO SLAVING meter with the limit values listed in table 2-4.

TABLE 2-4. ORION GYRO SLAVING AMPLIFIER TEST LIMITS

HDG SYN Setting (degrees)	*Gyro Slaving Current (milliamperes)*
0	−1.0 to +1.0
2*	−6.0 to −11.0
358*	+6.0 to +11.0

* The magnitudes of the measurements at 2 degrees and 358 degrees must be within 2.0 ma of each other.

2-32. HEADING BRIDGE TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to MAG HDG.

Step 4. Connect the Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks to indicate the heading signal, and set the DIRECTOR CONTROL pointer as accurately as possible to zero degrees to null the heading signal.

Step 5. Set the METER SCALE switch to 30 and read deviation current on the DEVIATION MICROAMPERES meter. If this reading is not 0 (±1.0) μa, replace R-30 with a selected resistor of the nearest RMA value between 560 and 1500 ohms which will zero the deviation current within 1 μa.

Step 6. Set the METER SCALE switch to 150, and adjusting the DIRECTOR CONTROL pointer knob, note the degree-settings required to produce −150 μa and +150 μa deviation current. For a reading of −150 μa, the pointer should indicate between limits of 349 and 353 degrees. For a reading of +150 μa, it should indicate between limits of 7 and 11 degrees.

2-33. HEADING COMPUTER TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT.

Step 4. Set the DIRECTOR CONTROL pointer knob to each of the angles listed in table 2-5 and for each setting, set the METER SCALE switch as required; then read and record the deviation current on the DEVIATION MICROAMPERES meter after it has become stabilized. (The cross-wind compensation circuit in the Amplifier makes the meter action very slow.) For the zero-degree setting, connect a Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks, and set the DIRECTOR CONTROL pointer to null the heading signal. The deviation current readings must be within the limits given in table 2-5. If they are not, adjust the heading computer as described in Step 5 of this procedure.

Note

If desired, the time required for the deviation current reading to stabilize may be decreased by replacing C11 (4μf) of the Amplifier with a 0.1-μf capacitor. *After the heading computer adjustments are completed, reinstall the original C11.*

TABLE 2-5. ORION HEADING COMPUTER TEST LIMITS

DIRECTOR CONTROL Setting (degrees)	*Deviation Current (microamperes)*
0	−2 to +2
5	+6 to +12
10*	+23 to +27
21 to 28†	+150†
332 to 339†	−150†
350*	−23 to −27
355	−6 to −12

* The magnitudes of the 10-degree and 350-degree currents must be within 5 μa of each other.

† For these readings, adjust the DIRECTOR CONTROL to obtain the specified deviation current and check that the DIRECTOR CONTROL setting is within the limits specified.

Step 5. If the deviation currents are not within the limits listed in table 2-5, proceed as follows:

a. Replace R11 in the Amplifier with a 22,000-ohm fixed resistor in series with a 25,000-ohm potentiometer.

b. Replace R24 in the Amplifier with a 680-ohm fixed resistor in series with a 1000-ohm potentiometer.

c. Replace R31 in the Amplifier with a 680,000-ohm fixed resistor in series with a 5-megohm potentiometer.

d. Adjust the 5-megohm potentiometer (R31) for equal and opposite deviation current at DIRECTOR CONTROL settings of 10 and 350 degrees.

e. Adjust the 25,000-ohm potentiometer (R11) and/or the 1000-ohm potentiometer (R24) to make the 10-degree deviation current as close as possible to +25 microamperes.

f. Readjust R31 as required to balance the 10-degree and 350-degree currents within 2 microamperes, and also readjust R11 and/or R24 as required to obtain current limits as close as possible to +25 microamperes for the 10-degree setting and −25 microamperes for the 350-degree setting.

g. Reinstall the original C11 (4μf) if it was replaced temporarily by a 0.1μf capacitor.

Step 6. With the DIRECTOR CONTROL set to 10 degrees, note the change in deviation current when the 60~ VOLTAGE switch is set to TEST. The current should not increase, nor should it decrease more than 7 μa. Reset the 60~ VOLTAGE switch to NORM.

NOTES:

1. ORION AMPLIFIER 511-600 IS RE-
QUIRED FOR ALL ORION TYPE
CD-1 TESTS, EXCEPT IN-11 AND
CRYSTAL DIODE TESTS. HOWEVI
THE OTHER CD-1 COMPONENTS
ARE TESTED INDIVIDUALLY AND
SHOULD BE CONNECTED IN THE
BENCH TEST SET-UP ONLY IF
THEY ARE BEING TESTED. FOR
FURTHER DETAILS REFER TO
INDIVIDUAL TEST PROCEDURES
IN THIS INSTRUCTION BOOK.

2. THESE CONNECTORS ARE NOT US
FOR TESTING THE ORION TYPE C
COURSE DIRECTOR.

3. FOR ASSOCIATED SCHEMATIC
DIAGRAM, SEE FIGURE 4-6.

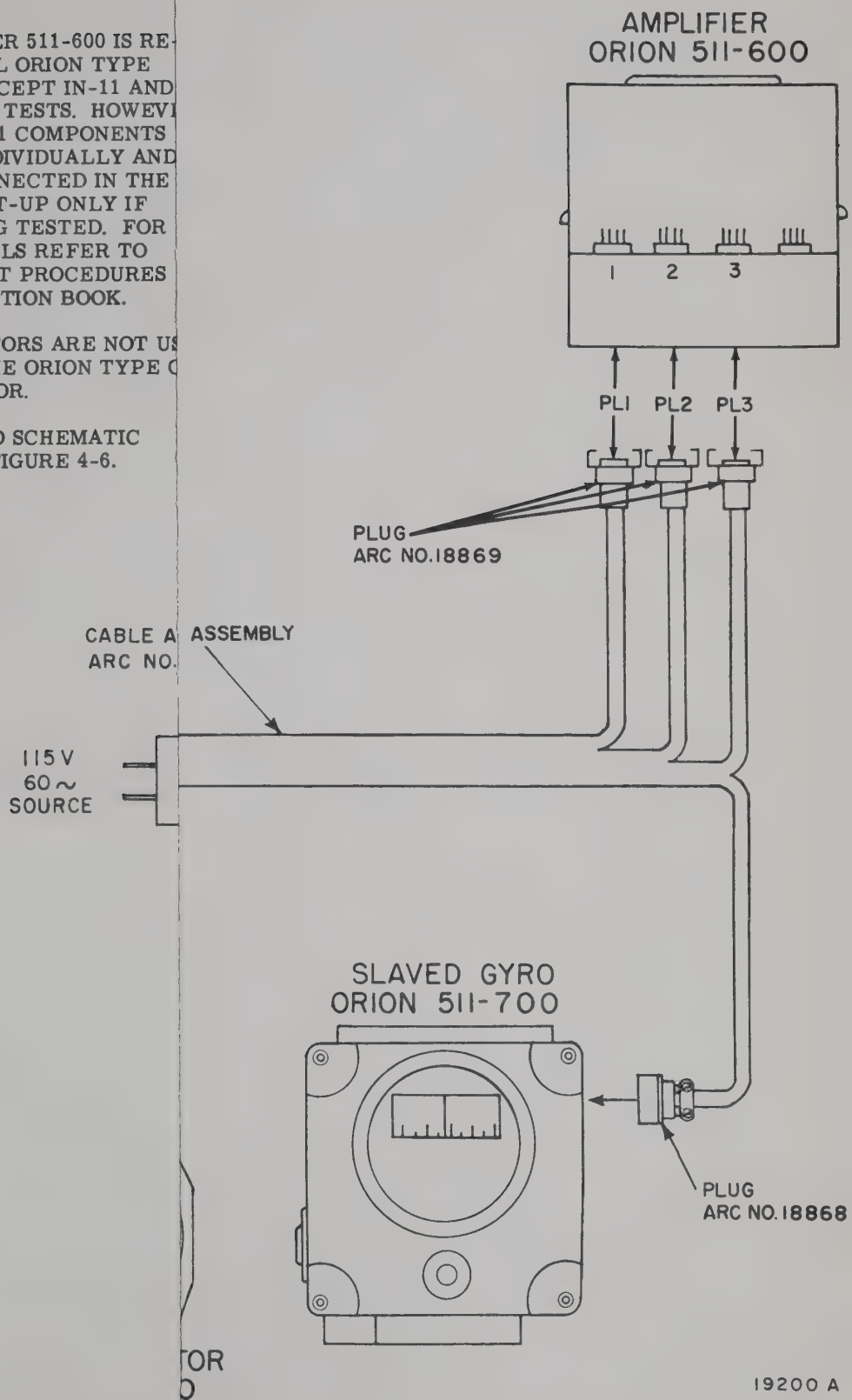


Figure 2-4. Bench Test Intercabling Diagram for ARC Type BTK-17 Bench Test Kit and Orion Type CD-1 Course Director

2-32. HEADING BRIDGE TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to MAG HDG.

Step 4. Connect the Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks to indicate the heading signal, and set the DIRECTOR CONTROL pointer as accurately as possible to zero degrees to null the heading signal.

Step 5. Set the METER SCALE switch to 30 and read deviation current on the DEVIATION MICROAMPERES meter. If this reading is not 0 (±1.0) μa, replace R-30 with a selected resistor of the nearest RMA value between 560 and 1500 ohms which will zero the deviation current within 1 μa.

Step 6. Set the METER SCALE switch to 150, and adjusting the DIRECTOR CONTROL pointer knob, note the degree-settings required to produce −150 μa and +150 μa deviation current. For a reading of −150 μa, the pointer should indicate between limits of 349 and 353 degrees. For a reading of +150 μa, it should indicate between limits of 7 and 11 degrees.

2-33. HEADING COMPUTER TEST AND ADJUSTMENT.

Step 1. Connect a Ballantine Model 300 voltmeter, or equivalent, to the COMP and GND test jacks.

Step 2. Set the HDG SYN instrument as accurately as possible to a zero-degree reading by adjusting its control to obtain a null indication on the voltmeter. (This is equivalent to a 0 (±0.5) ma GYRO SLAVING current reading.)

Step 3. Set the DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT.

Step 4. Set the DIRECTOR CONTROL pointer knob to each of the angles listed in table 2-5 and for each setting, set the METER SCALE switch as required; then read and record the deviation current on the DEVIATION MICROAMPERES meter after it has become stabilized. (The cross-wind compensation circuit in the Amplifier makes the meter action very slow.) For the zero-degree setting, connect a Ballantine Model 300 voltmeter, or equivalent, to the HDG and GND test jacks, and set the DIRECTOR CONTROL pointer to null the heading signal. The deviation current readings must be within the limits given in table 2-5. If they are not, adjust the heading computer as described in Step 5 of this procedure.

Note

If desired, the time required for the deviation current reading to stabilize may be decreased by replacing C11 (4μf) of the Amplifier with a 0.1-μf capacitor. *After the heading computer adjustments are completed, reinstall the original C11.*

TABLE 2-5. ORION HEADING COMPUTER TEST LIMITS

DIRECTOR CONTROL Setting (degrees)	*Deviation Current (microamperes)*
0	−2 to +2
5	+6 to +12
10*	+23 to +27
21 to 28†	+150†
332 to 339†	−150†
350*	−23 to −27
355	−6 to −12

* The magnitudes of the 10-degree and 350-degree currents must be within 5 μa of each other.

† For these readings, adjust the DIRECTOR CONTROL to obtain the specified deviation current and check that the DIRECTOR CONTROL setting is within the limits specified.

Step 5. If the deviation currents are not within the limits listed in table 2-5, proceed as follows:

a. Replace R11 in the Amplifier with a 22,000-ohm fixed resistor in series with a 25,000-ohm potentiometer.

b. Replace R24 in the Amplifier with a 680-ohm fixed resistor in series with a 1000-ohm potentiometer.

c. Replace R31 in the Amplifier with a 680,000-ohm fixed resistor in series with a 5-megohm potentiometer.

d. Adjust the 5-megohm potentiometer (R31) for equal and opposite deviation current at DIRECTOR CONTROL settings of 10 and 350 degrees.

e. Adjust the 25,000-ohm potentiometer (R11) and/or the 1000-ohm potentiometer (R24) to make the 10-degree deviation current as close as possible to +25 microamperes.

f. Readjust R31 as required to balance the 10-degree and 350-degree currents within 2 microamperes, and also readjust R11 and/or R24 as required to obtain current limits as close as possible to +25 microamperes for the 10-degree setting and −25 microamperes for the 350-degree setting.

g. Reinstall the original C11 (4μf) if it was replaced temporarily by a 0.1μf capacitor.

Step 6. With the DIRECTOR CONTROL set to 10 degrees, note the change in deviation current when the 60~ VOLTAGE switch is set to TEST. The current should not increase, nor should it decrease more than 7 μa. Reset the 60~ VOLTAGE switch to NORM.

NOTES:

1. ORION AMPLIFIER 511-600 IS REQUIRED FOR ALL ORION TYPE CD-1 TESTS, EXCEPT IN-11 AND CRYSTAL DIODE TESTS. HOWEVER, THE OTHER CD-1 COMPONENTS ARE TESTED INDIVIDUALLY AND SHOULD BE CONNECTED IN THE BENCH TEST SET-UP ONLY IF THEY ARE BEING TESTED. FOR FURTHER DETAILS REFER TO INDIVIDUAL TEST PROCEDURES IN THIS INSTRUCTION BOOK.
2. THESE CONNECTORS ARE NOT USED FOR TESTING THE ORION TYPE CD-1 COURSE DIRECTOR.
3. FOR ASSOCIATED SCHEMATIC DIAGRAM, SEE FIGURE 4-6.

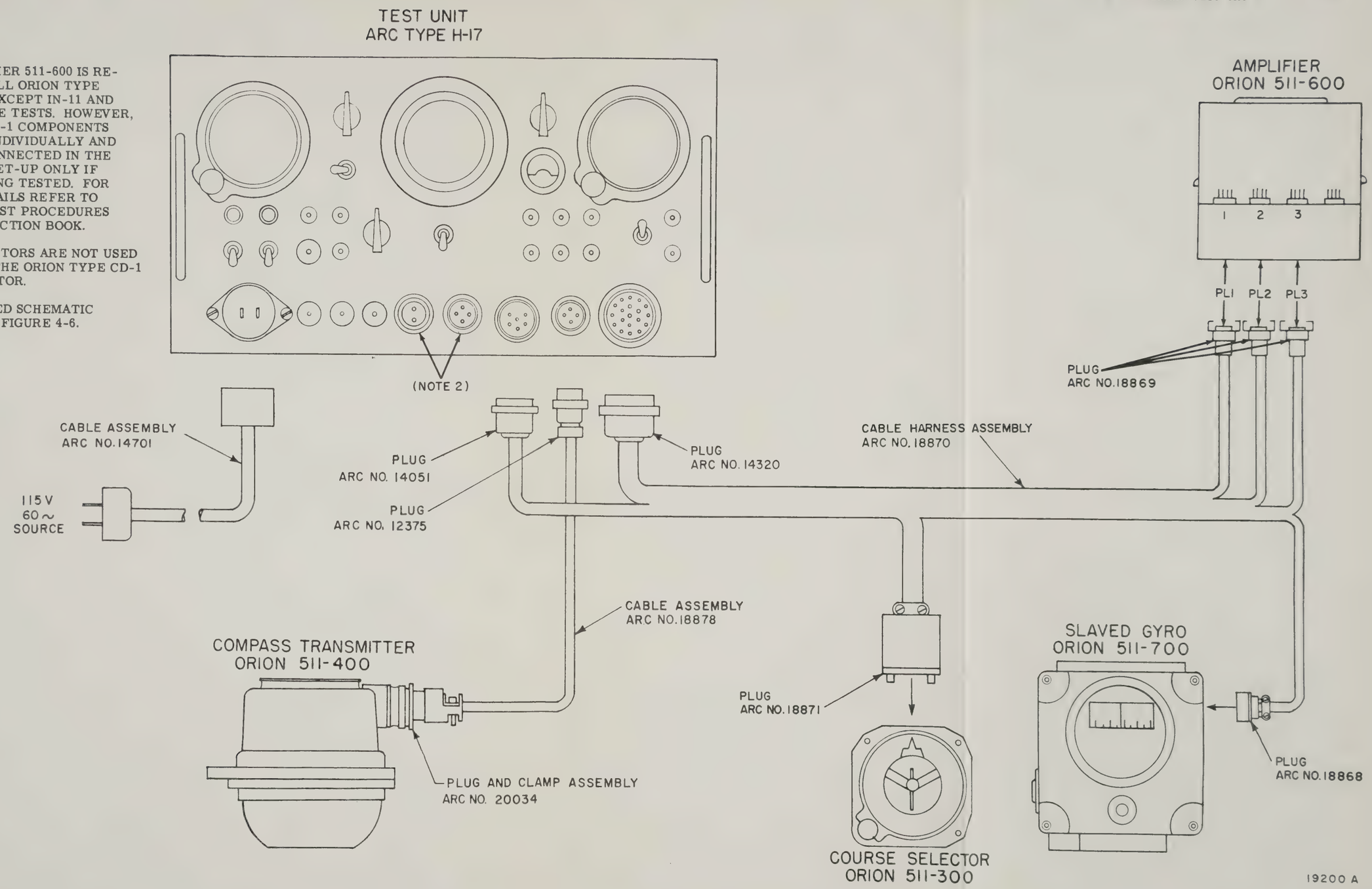


Figure 2-4. Bench Test Intercabling Diagram for ARC Type BTK-17 Bench Test Kit and Orion Type CD-1 Course Director

Step 7. Set the METER SCALE switch to 150, the DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT and its pointer to 10 degrees, and the HDG SYN switch to EXT.

Step 8. About 1 minute after performing Step 7, set the HDG SYN switch to INT, and disregarding the needle overswing due to the inertia of the meter movement, note the initial and stabilized values of deviation current indicated on the DEVIATION MICROAMPERES meter. Calculate 63 per cent of the difference between the two readings. Subtract the result from the initial (maximum) current reading. Reset the HDG SYN switch to EXT. Again after about 1 minute, reset the HDG SYN switch to INT and using a stop watch, or equivalent, measure the "time constant" as the time required for the deviation current to decay to the calculated value.

Step 9. Repeat Steps 7 and 8 at a DIRECTOR CONTROL setting of 350 degrees.

Step 10. At either DIRECTOR CONTROL setting, the "time constant" must be between the limits of 9 and 15 seconds. If not, check the value and condition of C11, R16, and R17 of the Amplifier.

2-34. ORION SLAVED GYRO AND COURSE SELECTOR SYNCHRO TESTS. To test the Orion Slaved Gyro and Course Selector synchros, interconnect the required components as shown in figure 2-4 and follow the applicable instructions of paragraphs 2-19 and 2-20, respectively.

2-35. ORION COURSE SELECTOR CRYSTAL DIODE TEST. To test the diodes of the Orion Course Selector, interconnect the required components as shown in figure 2-4 and follow the applicable instructions of paragraph 2-22.

2-36. ORION COMPASS TRANSMITTER TEST. To test the Orion Compass Transmitter, interconnect the required components as shown in figure 2-4 and follow the applicable instructions of paragraph 2-23; *however, note that there is a 60-degree difference in the indexing of the HDG SYN instrument and the Orion Compass Transmitter synchros.* Therefore, normal HDG SYN readings will be 60 degrees *less* than the Compass Turntable settings but within the same limits specified in Step 14 of paragraph 2-23.

2-37. ORION SLAVING METER TEST. To test the Orion Slaving Meter follow the applicable instructions of paragraph 2-24.

SECTION III

MAINTENANCE

3-1. INTRODUCTION.

3-2. This section contains preventive maintenance instructions, minor repair procedures, an equipment performance and trouble analysis chart, and synchro indexing information for the ARC Type H-17 Test Unit. To assist in maintaining the equipment, schematic and wiring diagrams are included in Section IV, and photographs of the H-17 are shown in figures 3-2, 3-3, and 3-4. The schematic diagram of the ARC Type H-17 includes normal voltage values measured at significant points. A parts list is included on the wiring diagram. Where a cable assembly is thought to be defective, reference to the schematic diagram and continuity checks will help to localize the fault. Removal and replacement procedures for the component parts of the ARC Type H-17 are not given as no special instructions are required. Except for the indexing of the synchros, it is recommended that instruments requiring major repairs or adjustments be returned to the factory.

3-3. PREVENTIVE MAINTENANCE.

3-4. Care in operating and handling the ARC Type BTK-17, and a reasonable program of preventive maintenance, will help to prevent defective operation. No special checks are required and no specific inspection schedule is recommended. But depending on the frequency of use, it is suggested that the equipment be checked for possible fraying of cable coverings, loose connectors, cracked terminal plates, defective terminals, loose knobs, broken or cracked instrument glass, and other possible damage which may be visible. Coupling nuts on the cable connectors should be secured only hand-tight when they are attached to mating connectors. Occasionally, the cabinet should be removed from the ARC Type H-17 Test Unit (refer to paragraph 3-8) and the chassis inspected for a possible accumulation of dirt, loose parts, signs of overheating, or other possible damage. If cleaning is required, clean, dry, medium-pressure, forced air is suggested.

3-5. LUBRICATION.

3-6. The DIRECTOR CONTROL and HDG SYN instruments are lubricated at the factory. No further lubrication is required.

3-7. CABINET REMOVAL AND REPLACEMENT.

3-8. The chassis of the ARC Type H-17 is secured within its cabinet by eight captive screws on the front panel and two on the rear of the cabinet. To remove the cabinet, loosen the two screws at the rear, stand the cabinet on its back, loosen the eight screws on the front, and by means of the two front handles lift the chassis out of the cabinet.

3-9. To reinstall the chassis, stand the cabinet on its back and lower the chassis into the cabinet. Secure the front panel screws loosely, erect the cabinet, and secure the two rear screws. Then, tighten all screws.

3-10. REPLACEMENT OF FUSES.

3-11. The ARC Type H-17 includes four active fuses installed in extractor-type fuseholders on the front panel. Spare fuses are located on the top of the H-17 chassis, at the right rear corner. When replacing a fuse, be sure to check the rating on the spare fuse before installing.

3-12. REPLACEMENT OF PANEL LAMPS.

3-13. Two 28-volt, midget, flange-base lamps (GE Type 327) installed in dimmer-type light assemblies on the front panel of the ARC Type H-17 are used to indicate the application of primary power. To replace a lamp, proceed as follows:

Step 1. Unscrew the lens cap and remove together with the lamp.

Step 2. With the thin edge of a knife blade (or the fingernails of the thumb and forefinger) inserted between the flange base of the lamp and the threaded bushing, withdraw the defective lamp.

Step 3. Insert a new lamp, seating the flange of the base firmly against the threaded bushing.

Step 4. Replace the lens cap, and screw in finger-tight.

3-14. EQUIPMENT PERFORMANCE AND TROUBLE ANALYSIS CHECK CHART.

3-15. GENERAL. Table 3-1 is an equipment performance and trouble analysis check chart based on the operation of the ARC Type H-17 Test Unit. No operational check of the Cable Assemblies is included since they may be tested conveniently through a visual inspection and/or electrical continuity check. The performance checks should be conducted in the order listed, as some of the steps presuppose that satisfactory results have been obtained in previous steps. The possible cause of an abnormal indication is localized to the parts which are possibly at fault. This information should be supplemented by referring to the schematic diagram, figure 4-1, and the wiring diagram, figure 4-2, for circuit details and other information. Also, to aid in isolating the cause of the trouble, voltage, resistance, and continuity checks should be made.

3-16. PRELIMINARY PROCEDURE. Before proceeding with the performance check of table 3-1, preset the input voltage and H-17 controls as follows:

Step 1. Connect a Type 200C Variac, or equivalent, to a 115-volt, 60-cycle power source.

Step 2. Connect a Hewlett-Packard Model 410B voltmeter, or equivalent, to the output of the Variac. Turn the primary power source on, and adjust the Variac for a 115-volt output, as read on the voltmeter. Turn the primary power off and disconnect the voltmeter.

Step 3. Connect the ARC Type H-17 to the output of the Variac with Cable Assembly ARC-14701, and connect a "standard" Computer Amplifier to the H-17 with Cable Assembly ARC-18876.

CAUTION

Do not power the H-17 through a constant voltage transformer since the resulting distorted wave form would give erroneous high-voltage readings.

Step 4. Set the controls on the H-17 as noted below and proceed with table 3-1.

HDG SYN to INT
COMP XMTR to INT
60~ VOLTAGE to NORM
DIRECTOR CONTROL to OMNI LOC
BLUE RIGHT
INCR LV to center position
METER SCALE to 150
60~ ON-OFF to ON

TABLE 3-1. EQUIPMENT PERFORMANCE AND TROUBLE ANALYSIS CHECK CHART

Step	*Procedure*	*Normal Indication*	*Possible Cause of Abnormal Indication*
1	Connect Ballantine Model 300 voltmeter, or equivalent, to LV and GND test jacks. Apply 115-volt, 60-cycle primary power.	Lamp DS102 lights. Voltmeter reads approximately 27.5 volts ac.	If voltmeter reads: lamp DS102 or lamp socket. If no voltage: Fuses F103, F104. Cable Assembly ARC-14701. Connector J117. Switches S106, S107, S108. Transforme T101. Test jacks J112 and J113. Variac setting. Primary power source.
2	Turn INCR LV switch to each position and note voltmeter reading.	Voltmeter reads approximately 25 volts in left position, 27.5 volts in center position, and 30 volts in right position.	Switch S106. Transformer T101.
3	Set INCR LV switch to center position. Set 60~ VOLTAGE switch to TEST.	Voltmeter reads approximately 22 volts.	Resistor R108. Switch S107.
4	Set 60~ VOLTAGE switch to NORM. Connect d-c voltmeter (500-volt range) to HV and GND test jacks.	Voltmeter reads between 265 and 295 volts dc.	Fuse F101. Capacitors C101, C102. Crystal rectifiers CR102, CR103, CR104, CR105. Transformer T101. (Computer Amplifier not connected or defective.)
5	Connect Hewlett-Packard Model 410B voltmeter, or equivalent, to DIODE TEST test jack.	Voltmeter reads between 0.45 and 0.55 volt dc.	Crystal rectifier CR101. Resistors R105, R106, R107. Capacitor C103.
6	Connect Ballantine Model 300 voltmeter, or equivalent, to COMP and GND test jacks. Set HDG SYN instrument in vicinity of zero degrees to null compass signal as indicated on voltmeter and note pointer setting.	Null occurs at 0 (±0.5) degrees setting of HDG SYN.	Heading Synchro, Z101, or Synchrotel, B101, indexed incorrectly, or defective (refer to paragraph 3-17).

TABLE 3-1. EQUIPMENT PERFORMANCE AND TROUBLE ANALYSIS CHECK CHART—Continued

Step	*Procedure*	*Normal Indication*	*Possible Cause of Abnormal Indication*
7	Connect Ballantine Model 300 voltmeter, or equivalent, to HDG and GND test jacks. Set DIRECTOR CONTROL switch to MAG HDG. Set HDG SYN instrument to zero degrees. Set DIRECTOR CONTROL pointer to null heading signal as indicated on voltmeter and note pointer setting.	Null occurs at 0 (±0.5) degrees setting of DIRECTOR CONTROL.	DIRECTOR CONTROL synchro, B301, indexed incorrectly, or defective (refer to paragraph 3-19).
8	Set HDG SYN instrument to 10 degrees.	GYRO SLAVING meter deflects approximately 8.5 ma to left and DEVIATION MICROAMPERES meter deflects approximately 100 μa to left.	Switch S103. Meter M101. Meter M102 (150 μa range). (If direction is reversed, check wiring; see figure 4-2.)
	Set DIRECTOR CONTROL pointer in vicinity of 10 degrees to zero the DEVIATION MICROAMPERES reading. Record pointer setting.	DIRECTOR CONTROL pointer indicates from 9 to 11 degrees.	Incorrect wiring; see figure 4-2.
9	Set HDG SYN instrument to zero degrees and DIRECTOR CONTROL switch to LOC BLUE LEFT. Set DIRECTOR CONTROL pointer to 16 degrees.	Final reading of DEVIATION MICROAMPERES meter between 20 and 30 μa to left (set METER SCALE to 30 when current falls below 30 μa).	Switch S103. Meter M102 (30 μa range). Incorrect wiring; see figure 4-2.
	Set DIRECTOR CONTROL to STANDBY.	DEVIATION MICROAMPERES meter reads zero.	
	Set DIRECTOR CONTROL switch to OMNI LOC BLUE RIGHT.	Final reading of DEVIATION MICROAMPERES meter between 20 and 30 μa to right (set METER SCALE to 30 when current falls below 30 μa).	Switch S301B.
10	Set METER SCALE to 450 and DIRECTOR CONTROL pointer to obtain one-third full-scale deflection; then set METER SCALE to 150.	DEVIATION MICROAMPERES meter indicates 150, ±1 division.	Switch S103. Resistors R109, R110.
	Set METER SCALE to 450 and DIRECTOR CONTROL pointer to 90 degrees.	DEVIATION MICROAMPERES meter indicates 100 to 115 on 150-μa scale (equivalent to 300 to 345 μa).	Meter M102.
11	Set the HDG SYN instrument to 1 degree. Strike the top of the H-17 sharply with fist and observe GYRO SLAVING and DEVIATION MICROAMPERES meters for evidence of instability.	*Slight* fluctuation of the GYRO SLAVING and DEVIATION MICROAMPERES meters may be observed.	Loose wiring.

3-17. CHECKING AND INDEXING HEADING SYNCHRO Z101.

3-18. If the compass signal null in Step 6 of table 3-1 does not occur at 0 (±0.5) degrees, either the Heading Synchro, Z101, or the Synchrotel, B101, is at fault. To localize the trouble, proceed as follows:

Step 1. Remove ARC Type H-17 chassis from its cabinet (refer to paragraph 3-8).

Step 2. Remove the three screws at the rear of the Heading Synchro and slide the cover back.

Step 3. With a Computer Amplifier connected through Cable Harness Assembly ARC-18876 (or an Orion Amplifier through Cable Harness Assembly ARC-18870), and the H-17 connected to the 115-volt, 60-cycle source using Cable Assembly ARC-14701, set the HDG SYN switch to EXT and the 60~ ON-OFF switch to ON.

Step 4. Connect a Simpson Model 260 multimeter (2.5-volt a-c scale), or equivalent, to terminals C and D of the instrument receptacle. Adjust the HDG SYN pointer in the vicinity of zero degrees until a null is indicated on the voltmeter.

Step 5. Connect the Simpson Model 260 (50-volt a-c scale), or equivalent, to read the voltages across terminals A and C and across terminals A and B of the receptacle. If the voltage from A to C is approximately 1.4 times the voltage from A to B, and the pointer is

set to 0 (±0.5) degrees, the Heading Synchro is functioning properly and is indexed correctly, and no further adjustment is required. Replace the cover. If the Heading Synchro is normal, the Synchrotel, B101, is probably at fault and should be replaced. However, if the requirements noted previously are not satisfied, it is possible that re-indexing of the Heading Synchro is needed. Proceed with Steps 6 through 10 of this procedure.

Step 6. Connect the Simpson Model 260 (2.5-volt a-c scale), or equivalent, to terminals C and D. Set the pointer exactly to zero degrees. Loosen the screws holding the synchro (see figure 3-1) and rotate the synchro until a null is indicated on the voltmeter.

Step 7. Measure the voltages across terminals A and C, and A and B. If the indexing is correct, the voltage across A and C will be approximately 1.4 times the voltage from A to B. If not, rotate the synchro 180 degrees from the position of Step 6 and repeat Step 6. Recheck the voltage measurements across terminals A and C, and A and B.

Step 8. Tighten the synchro mounting screws, taking care not to shift the synchro. Repeat Step 4 of this procedure, checking that the null occurs at 0 (±0.5) degrees.

Step 9. Seal the mounting screws with black Glyptal, or equivalent. Replace the cover.

Step 10. Reset HDG SYN to INT and repeat Step 6 of table 3-1. If the compass signal null does not occur at 0 (±0.5) degrees, it may be assumed that Synchrotel B101 is improperly indexed or defective. Replace the Synchrotel as a complete unit.

3-19. CHECKING AND INDEXING SYNCHRO OF DIRECTOR CONTROL Z102.

3-20. If the heading signal null in Step 7 of table 3-1 does not occur at 0 (±0.5) degrees, first check Heading Synchro Z101 (refer to paragraph 3-17); if the Heading Synchro Z101 is functioning properly, the synchro of Director Control Z102 may be improperly indexed or defective. Check the synchro as follows:

Step 1. Remove ARC Type H-17 chassis from cabinet (refer to paragraph 3-8).

Step 2. Remove the plug from the DIRECTOR CONTROL and connect the appropriate plug of Cable Harness Assembly ARC-18876. Short the HDG and GND test jacks.

Step 3. Connect 115-volt, 60-cycle power to the H-17 using Cable Assembly ARC-14701, and connect a Computer Amplifier to Cable Harness Assembly ARC-18876. Set 60~ ON OFF switch to ON.

Step 4. Check the indexing of the DIRECTOR CONTROL synchro, as described in paragraph 2-20. If re-indexing is required, proceed with Steps 5 through 10 of this procedure; if not, proceed with Step 10.

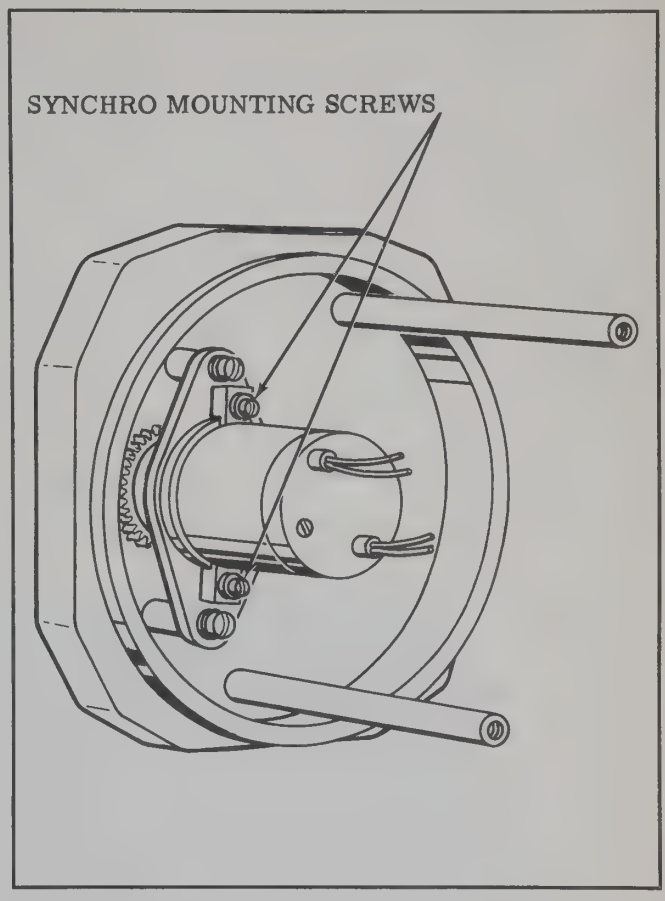


Figure 3-1. Location of Synchro Mounting Screws

Step 5. Remove the three screws at the rear of the DIRECTOR CONTROL and remove the cover.

Step 6. Connect a Simpson Model 260 multimeter (2.5-volt a-c scale), or equivalent, to the YEL and BLU test jacks. Set the DIRECTOR CONTROL pointer exactly to 270 degrees. Loosen the screws holding the synchro (see figure 3-1) and rotate the synchro until a null between the YEL and BLU test jacks is indicated.

Step 7. Connect the Simpson Model 260 (50-volt a-c scale) to read the voltages across the YEL and OSC test jacks, and the OSC and GND test jacks. If the indexing is correct, the YEL-to-OSC voltage will be approximately 1.4 times the OSC-to-GND voltage. If not, rotate the synchro 180 degrees from the position of Step 6 and repeat Step 6.

Step 8. Tighten the synchro mounting screws, taking care not to shift the synchro. Check the indexing as described in paragraph 2-20.

Step 9. Seal the mounting screws with black Glyptal, or equivalent. Replace the cover.

Step 10. Turn the power off, remove the HDG-to-GND short, and reconnect the original cable to the DIRECTOR CONTROL.

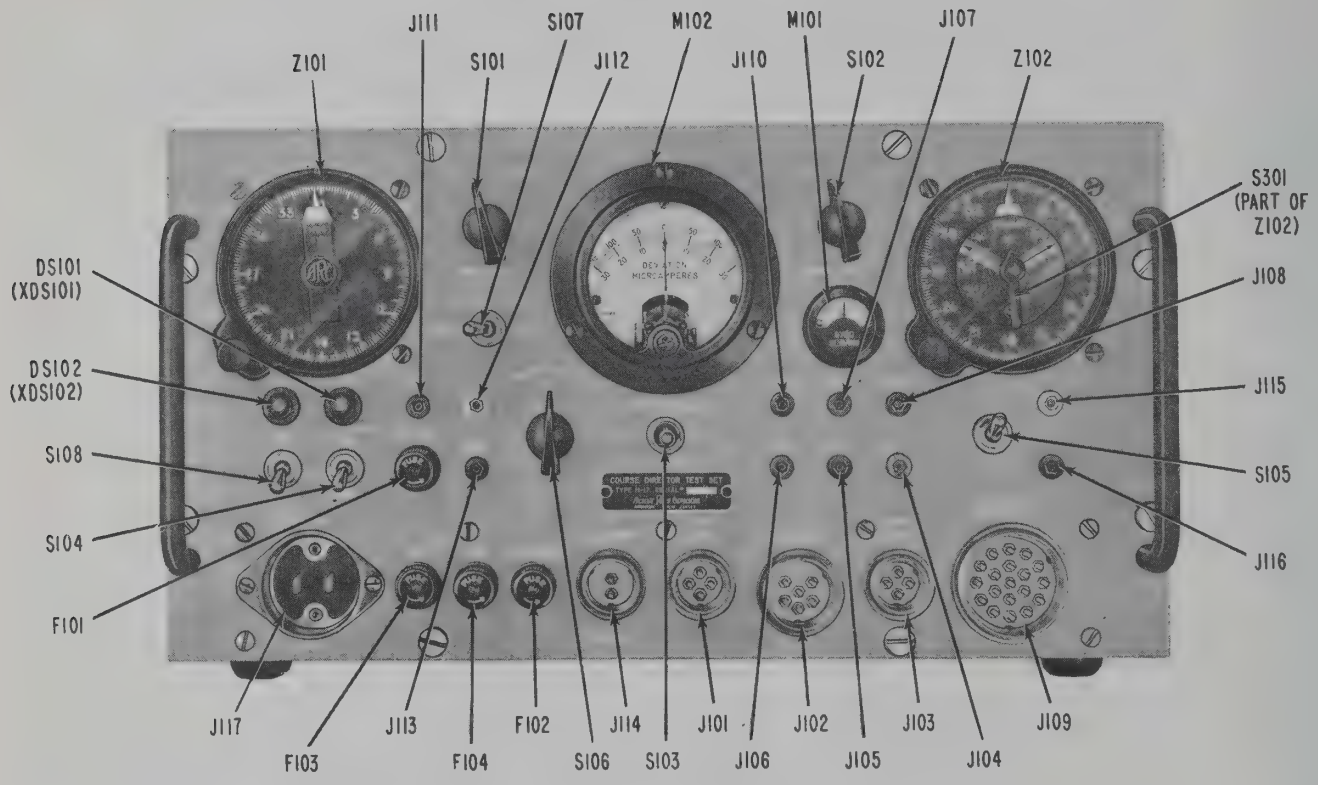


Figure 3-2. ARC Type H-17 Test Unit, Front View

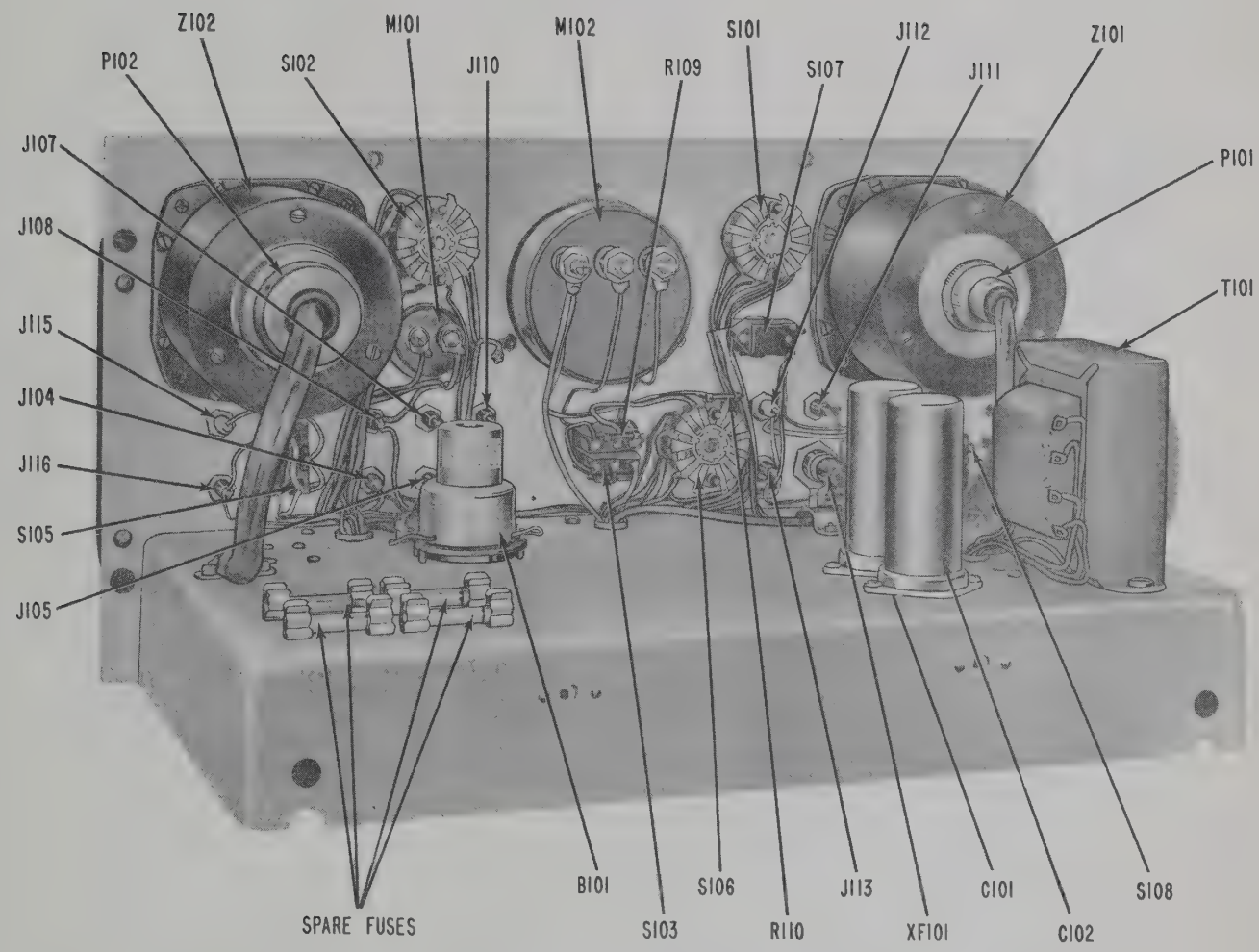


Figure 3-3. ARC Type H-17 Test Unit, Top Interior View

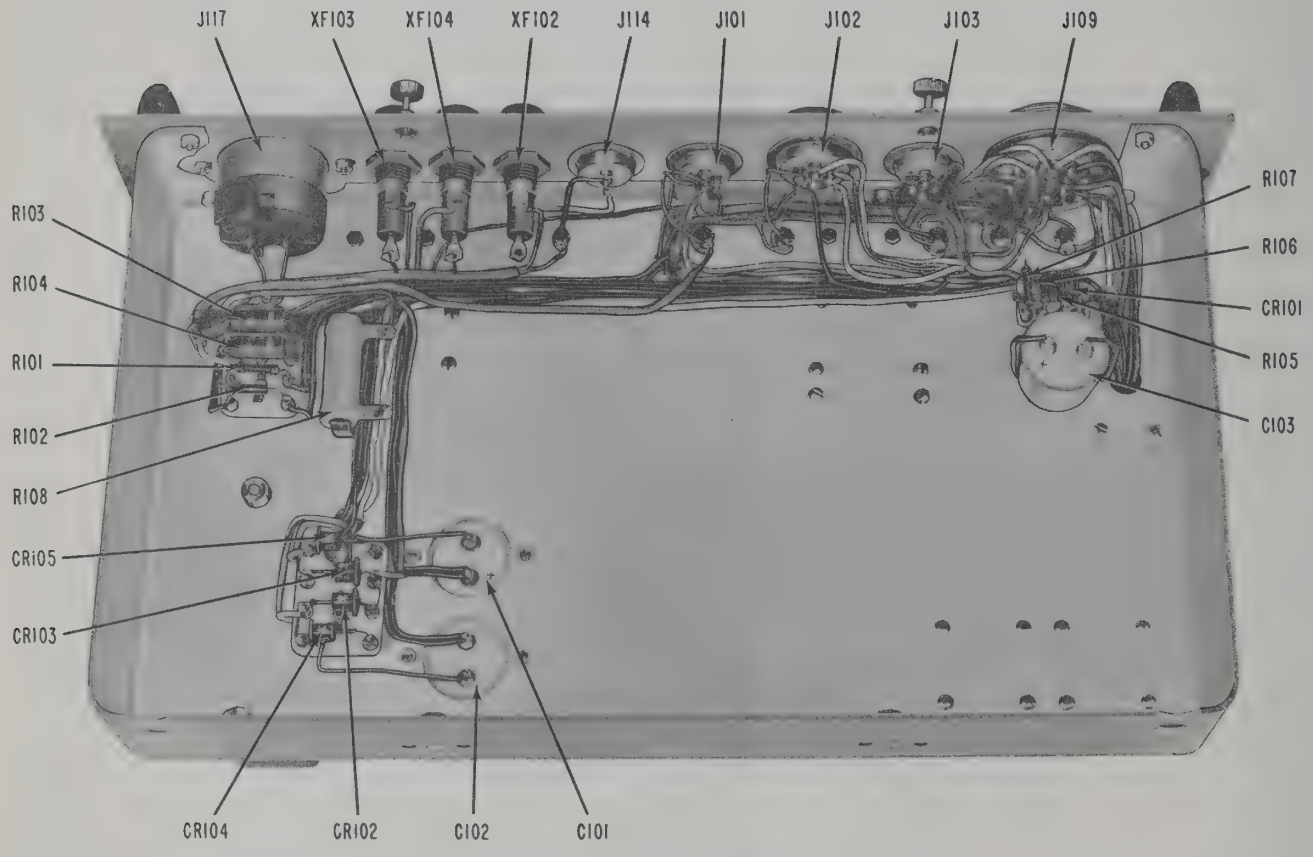
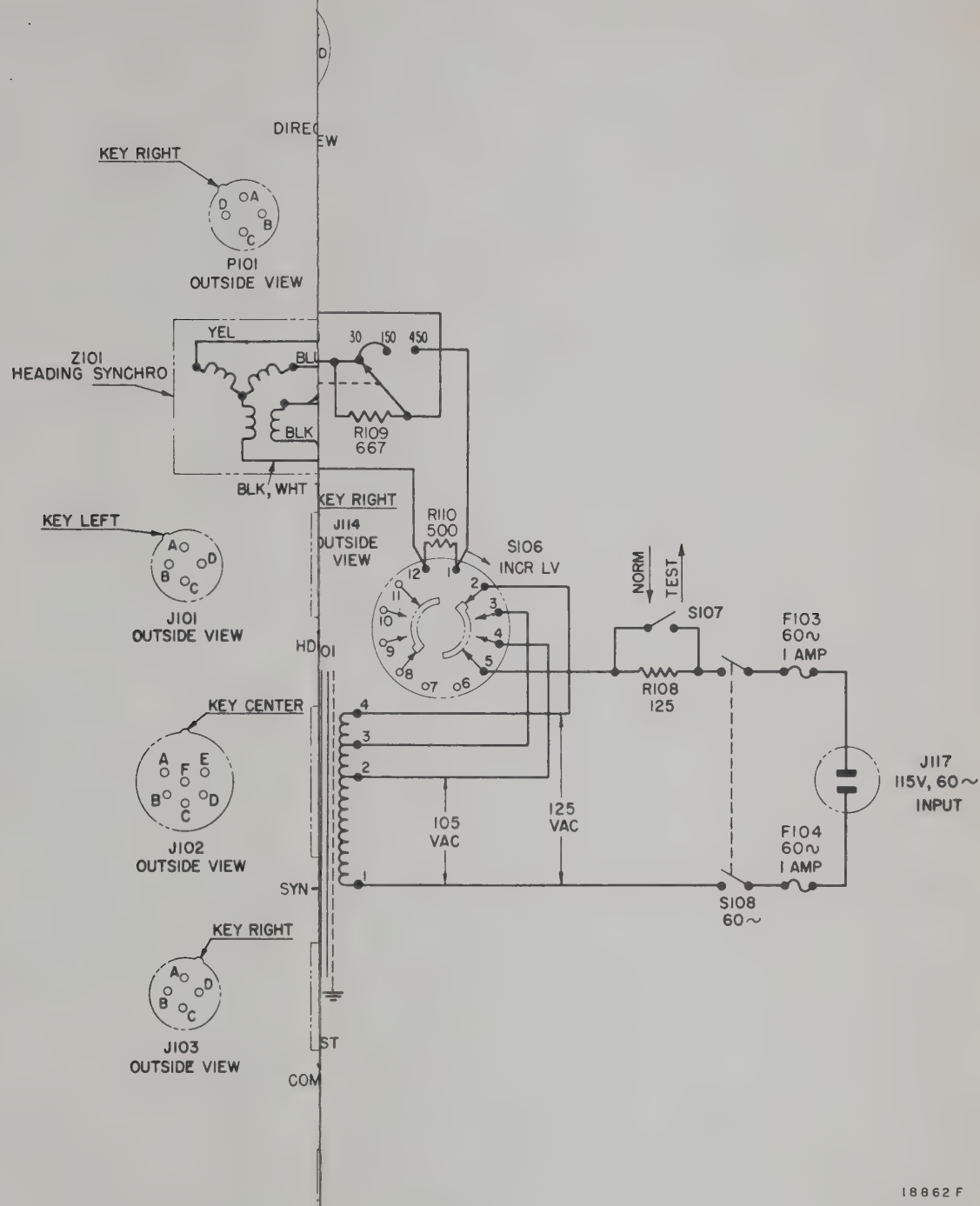


Figure 3-4. ARC Type H-17 Test Unit, Bottom Interior View

SECTION IV

DIAGRAMS



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RING DIAGRAM SEE FIGURE 4-2.

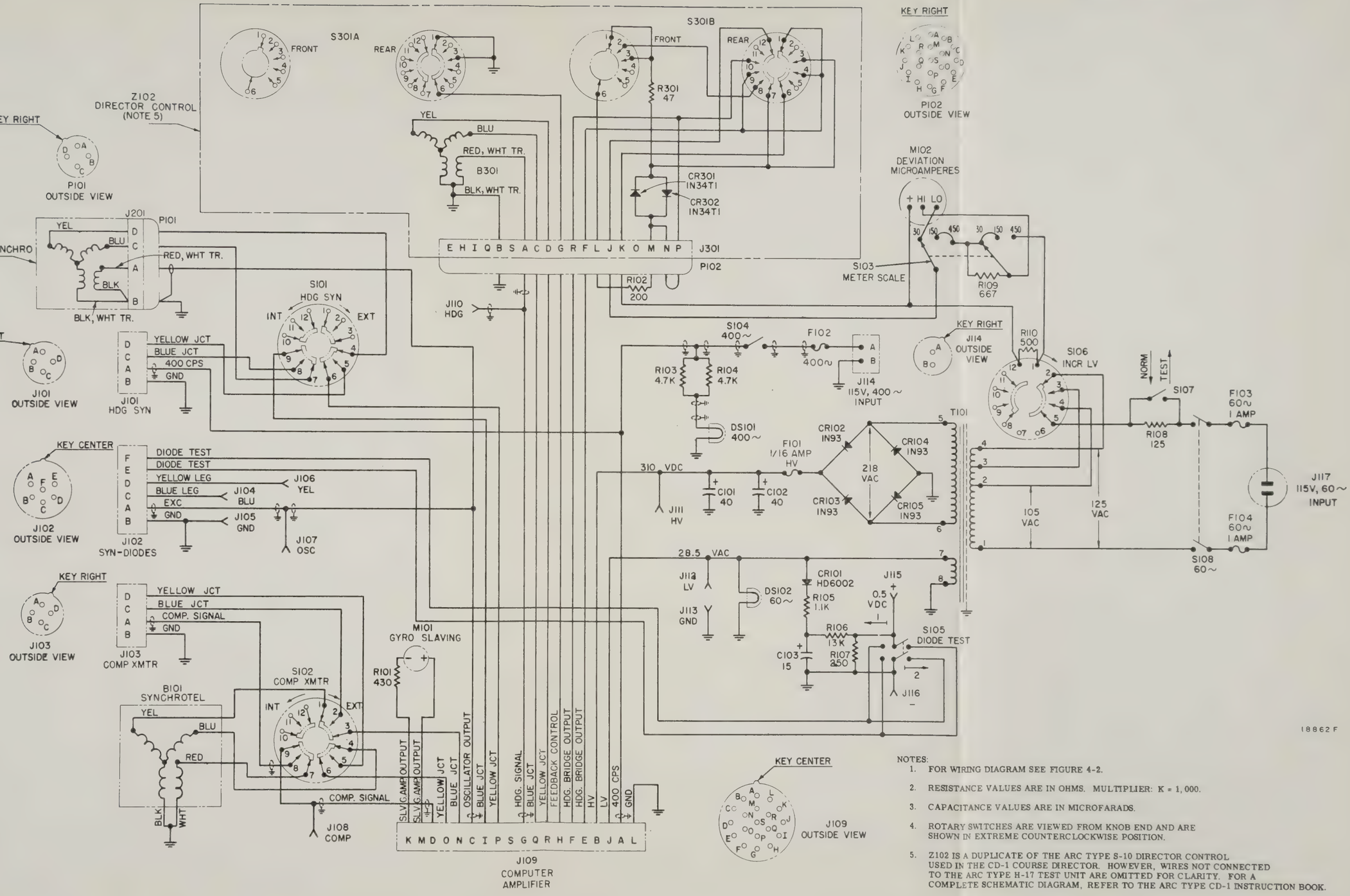
ANCE VALUES ARE IN OHMS. MULTIPLIER: K = 1,000.

TANCE VALUES ARE IN MICROFARADS.

Y SWITCHES ARE VIEWED FROM KNOB END AND ARE
IN EXTREME COUNTERCLOCKWISE POSITION.

A DUPLICATE OF THE ARC TYPE S-10 DIRECTOR CONTROL
THE CD-1 COURSE DIRECTOR. HOWEVER, WIRES NOT CONNECTED
ARC TYPE H-17 TEST UNIT ARE OMITTED FOR CLARITY. FOR A
ETE SCHEMATIC DIAGRAM, REFER TO THE ARC TYPE CD-1 INSTRUCTION BOOK.

Figure 4-1. ARC Type H-17 Test Unit, Schematic Diagram



NOTES:

1. FOR WIRING DIAGRAM SEE FIGURE 4-2.
2. RESISTANCE VALUES ARE IN OHMS. MULTIPLIER: K = 1,000.
3. CAPACITANCE VALUES ARE IN MICROFARADS.
4. ROTARY SWITCHES ARE VIEWED FROM KNOB END AND ARE SHOWN IN EXTREME COUNTERCLOCKWISE POSITION.
5. Z102 IS A DUPLICATE OF THE ARC TYPE S-10 DIRECTOR CONTROL USED IN THE CD-1 COURSE DIRECTOR. HOWEVER, WIRES NOT CONNECTED TO THE ARC TYPE H-17 TEST UNIT ARE OMITTED FOR CLARITY. FOR A COMPLETE SCHEMATIC DIAGRAM, REFER TO THE ARC TYPE CD-1 INSTRUCTION BOOK.

Figure 4-1. ARC Type H-17 Test Unit, Schematic Diagram

PARTS IDENTIFICATI

MULTIPLIER FOR RESISTANCE			RE
REFERENCE DESIGNATION	ARC PART NO.	DESCRIPTION	DE
B101	18808	SYNCHROTEL, LOCKED	
C101	13154	40μF	
C102	13154	40μF	
C103	5416	15μF	
CR101	17633	HD6002	
CR102	18495	1N93	
CR103	18495	1N93	
CR104	18495	1N93	
CR105	18495	1N93	
DS101	8622	LAMP(28 V)	
DS102	8622	LAMP(28 V)	
F101	8807	1/16 AMP FUSE	
F102	8644	1/4 AMP FUSE	
F103	8628	1 AMP FUSE	
F104	8628	1 AMP FUSE	
J101	12431	RECEPTACLE	
J102	11905	RECEPTACLE	
J103	12428	RECEPTACLE	
J104	8803	TEST JACK(D. BLU)	
J105	8803	TEST JACK(BLK)	
J106	8803	TEST JACK(YEL)	
J107	8803	TEST JACK(ORN)	
J108	8803	TEST JACK(D. GRN)	
J109	12096	RECEPTACLE	
J110	8803	TEST JACK(BRN)	
J111	8803	TEST JACK(RED)	
J112	8803	TEST JACK(WHT)	
J113	8803	TEST JACK(BLK)	
J114	12430	RECEPTACLE	
J115	8803	TEST JACK(L. GRN)	
J116	8803	TEST JACK(BLK)	
J117	14714	PLUG BASE	

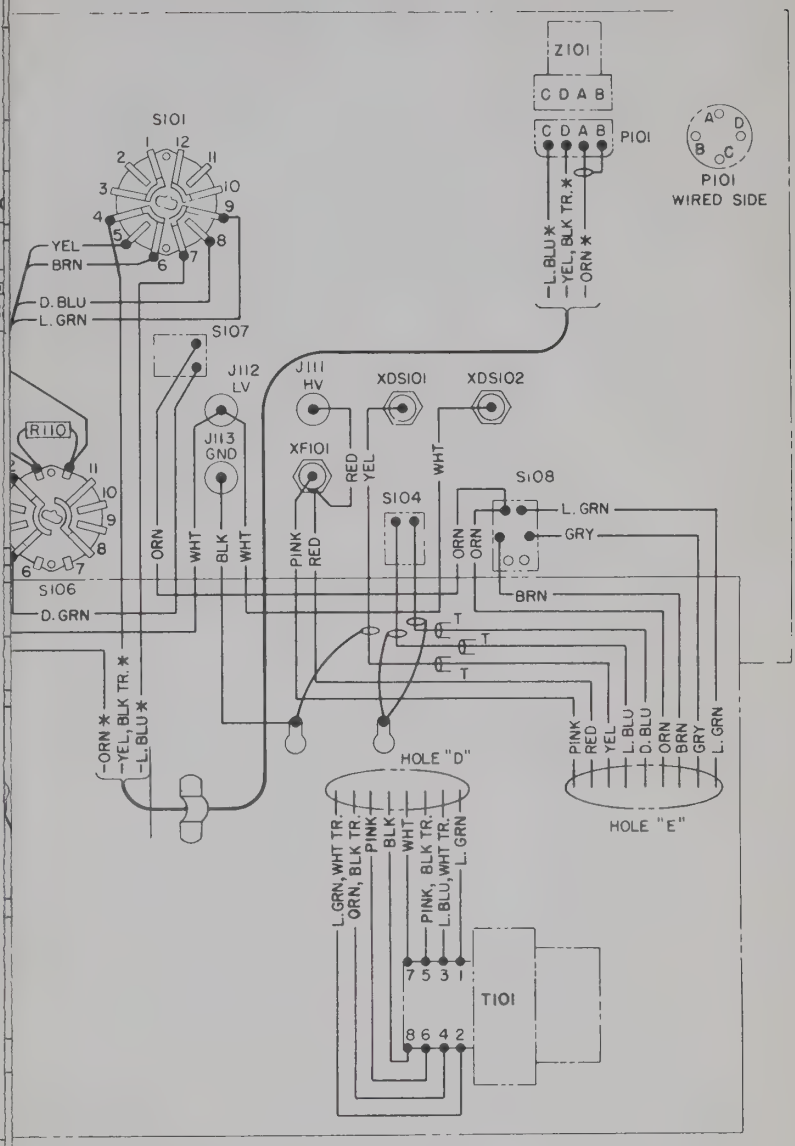


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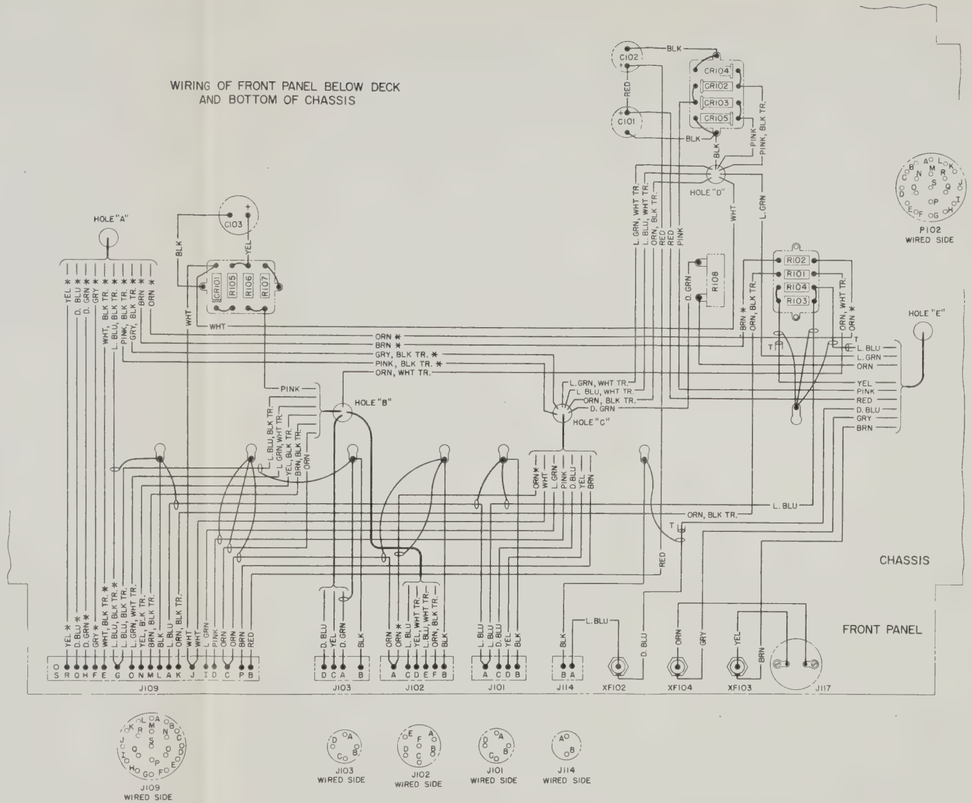
Figure 4-2. ARC Type H-17 Test Unit, Wiring Diagram

PARTS IDENTIFICATION TABLE

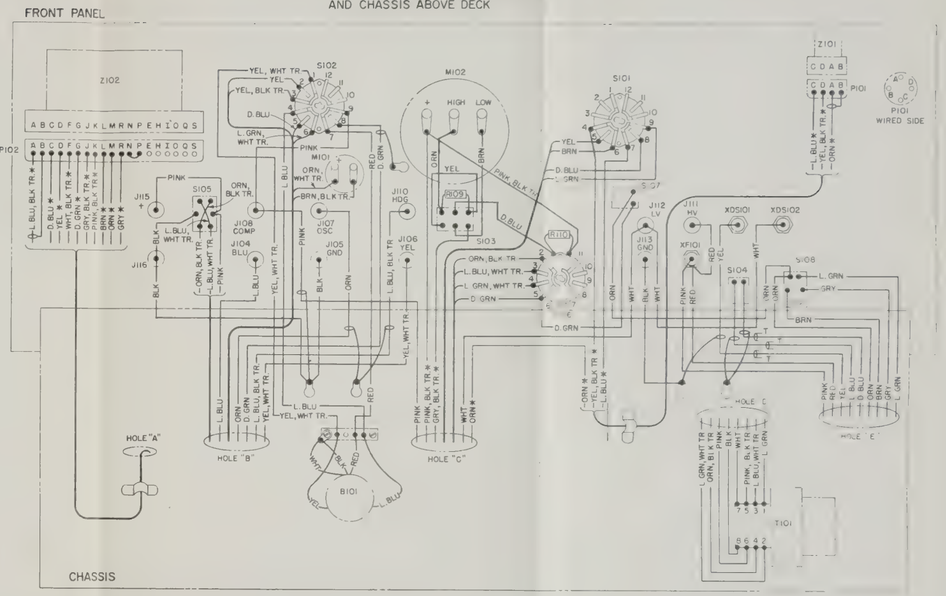
MULTIPLIER FOR RESISTANCE VALUES: K = 1,000

REFERENCE DESIGNATION	ARC PART NO.	DESCRIPTION	REFERENCE DESIGNATION	ARC PART NO.	DESCRIPTION
B101	18808	SYNCHROTEL, LOCKED	M101	18462	MILLIAMMETER
			M102	18458	MICROAMMETER
C101	13154	40 μF			
C102	13154	40 μF	P101	14052	PLUG
C103	5416	15 μF	P102	14843	PLUG
			R101	205	430 OHMS
CR101	17633	HD6002	R102	201	200 OHMS
CR102	18495	1N93	R103	203	4700 OHMS
CR103	18495	1N93	R104	203	4700 OHMS
CR104	18495	1N93	R105	201	1100 OHMS
CR105	18495	1N93	R106	201	12K OHMS
			R107	205	250 OHMS
DS101	8622	LAMP(28 V)	R108	206	125 OHMS
DS102	8622	LAMP(28 V)	R109	205	667 OHMS
			R110	205	500 OHMS
F101	8807	1-16 AMP FUSE	S101	18459	SWITCH, ROTARY
F102	8644	1/4 AMP FUSE	S102	18459	SWITCH, ROTARY
F103	8628	1 AMP FUSE	S103	8642	SWITCH
F104	8628	1 AMP FUSE	S104	8084	SWITCH, SPST
			S105	8085	SWITCH, DPDT
J101	12431	RECEPTACLE	S106	17578	SWITCH, ROTARY
J102	11905	RECEPTACLE	S107	8084	SWITCH, SPST
J103	12428	RECEPTACLE	S108	8085	SWITCH, DPST
J104	8803	TEST JACK(D. BLU)			
J105	8803	TEST JACK(BLK)	T101	18791	TRANSFORMER
J106	8803	TEST JACK(YEL)			
J107	8803	TEST JACK(ORN)	XDS101	16417	RED PILOT LIGHT
J108	8803	TEST JACK(D. GRN)	XDS102	16417	RED PILOT LIGHT
J109	12096	RECEPTACLE			
J110	8803	TEST JACK(BRN)	XF101	8170	FUSE HOLDER
J111	8803	TEST JACK(RED)	XF102	8170	FUSE HOLDER
J112	8803	TEST JACK(WHT)	XF103	8170	FUSE HOLDER
J113	8803	TEST JACK(BLK)	XF104	8170	FUSE HOLDER
J114	12430	RECEPTACLE			
J115	8803	TEST JACK(L. GRN)	Z101	18780	HEADING SYNCHRO
J116	8803	TEST JACK(BLK)	Z102	20200	DIRECTOR CONTROL
J117	14714	PLUG BASE			

WIRING OF FRONT PANEL BELOW DECK AND BOTTOM OF CHASSIS



WIRING OF FRONT PANEL VIEWED FROM REAR AND CHASSIS ABOVE DECK



NOTES:

1. FOR SCHEMATIC DIAGRAM SEE FIGURE 4-1.
2. ALL WIRES MARKED WITH COLOR NOTE ARE NO. 22 SOLID COPPER WIRE, VINYLITE INSULATED.
3. ALL WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE NO. 22 STRANDED COPPER WIRE, VINYLITE INSULATED.
4. ALL UNMARKED WIRES ARE NO. 22 SOLID, BARE, TINNED COPPER.
5. WIRES INDICATED BY —0— ARE SHIELDED WITH TINNED COPPER BRAID.
6. SHIELDED WIRES MARKED —T— ARE COVERED WITH TRANSPARENT VINYLITE TUBING OF APPROPRIATE SIZE.
7. SHADED AREA ON CRYSTAL RECTIFIER CR101 INDICATES CATHODE END.
8. SWITCH SECTIONS S101, S102, AND S106 ARE SHOWN IN EXTREME CLOCKWISE POSITION.

18861F

Figure 4-2. ARC Type H-17 Test Unit, Wiring Diagram

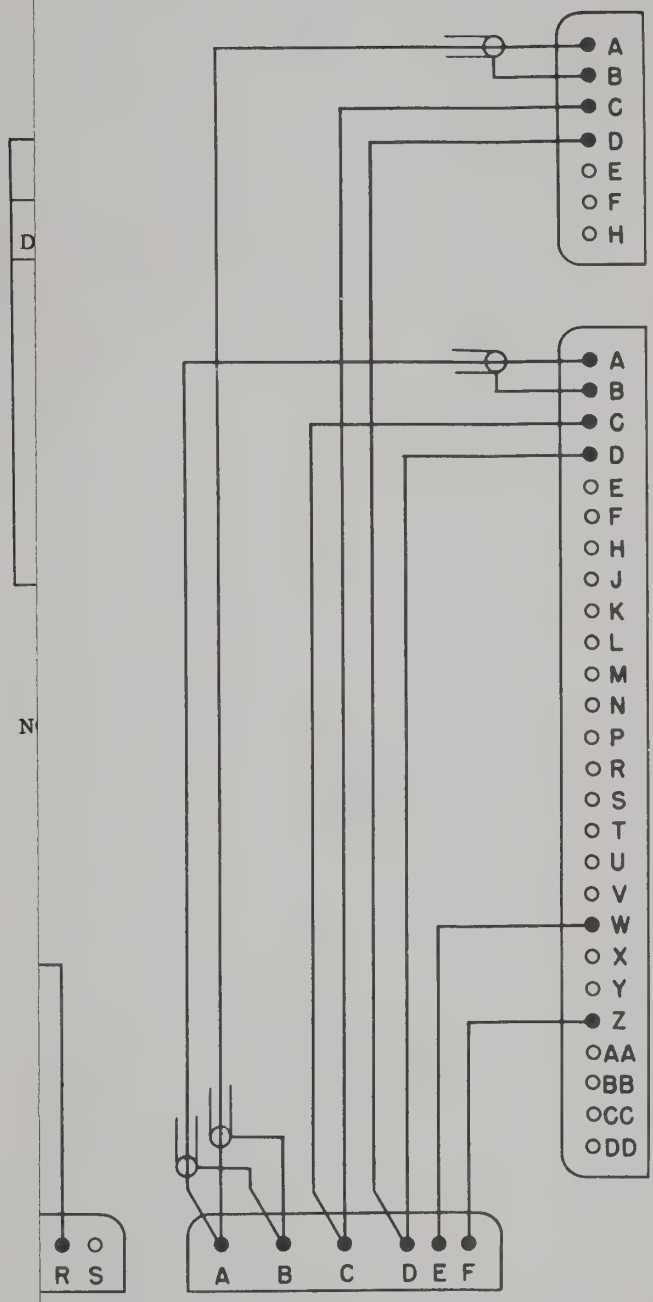


Figure 4-3. Cable Harness Assembly ARC-18870, Schematic Diagram

TABLE OF WIRE LENGTHS			
WIRE DESIGNATION	LENGTH (inches)	WIRE DESIGNATION	LENGTH (inches)
1A TO 6G(*)	27	3C TO 6I	29
1C TO 6Q	27	3D TO 6P	29
1D TO 6R	27	3H TO 6B	29
1E TO 6F	27	3K TO 6J	29
1F TO 6E	27	4A TO 7A(*)	33 1/2
1J TO 6H	27	4C TO 7C	33 1/2
2A TO 6C(*)	28	4D TO 7D	33 1/2
2C TO 6N	28	5A TO 7A(*)	30 1/2
2D TO 6O	28	5C TO 7C	30 1/2
2E TO 6K	28	5D TO 7D	30 1/2
2K TO 6M	28	5Y TO 7E	30 1/2
3A TO 6D(*)	29	5Z TO 7F	30 1/2
3B TO 6L	29		

NOTE:
1. WIRES INDICATED BY ASTERISK (*) IN WIRE TABLE OR BY ⊖═ IN DIAGRAM ARE NO. 22 STRANDED, TINNED COPPER BRAID, SHIELDED WIRES. SHIELDS ARE CONNECTED AS INDICATED. (DO NOT CONNECT SHIELDS AT PLUG NO. 1, 2, OR 3). FIBERGLASS TUBING OF APPROPRIATE SIZE IS INSTALLED OVER ENDS OF BRAID (PIGTAIL) AND OVER ENDS OF WIRES, TO PREVENT SHORTING TO OTHER TERMINALS. ALL OTHER WIRES ARE NO. 22 STRANDED COPPER, WITH FIBROUS GLASS BRAID AND OUTER PROTECTIVE COATING.

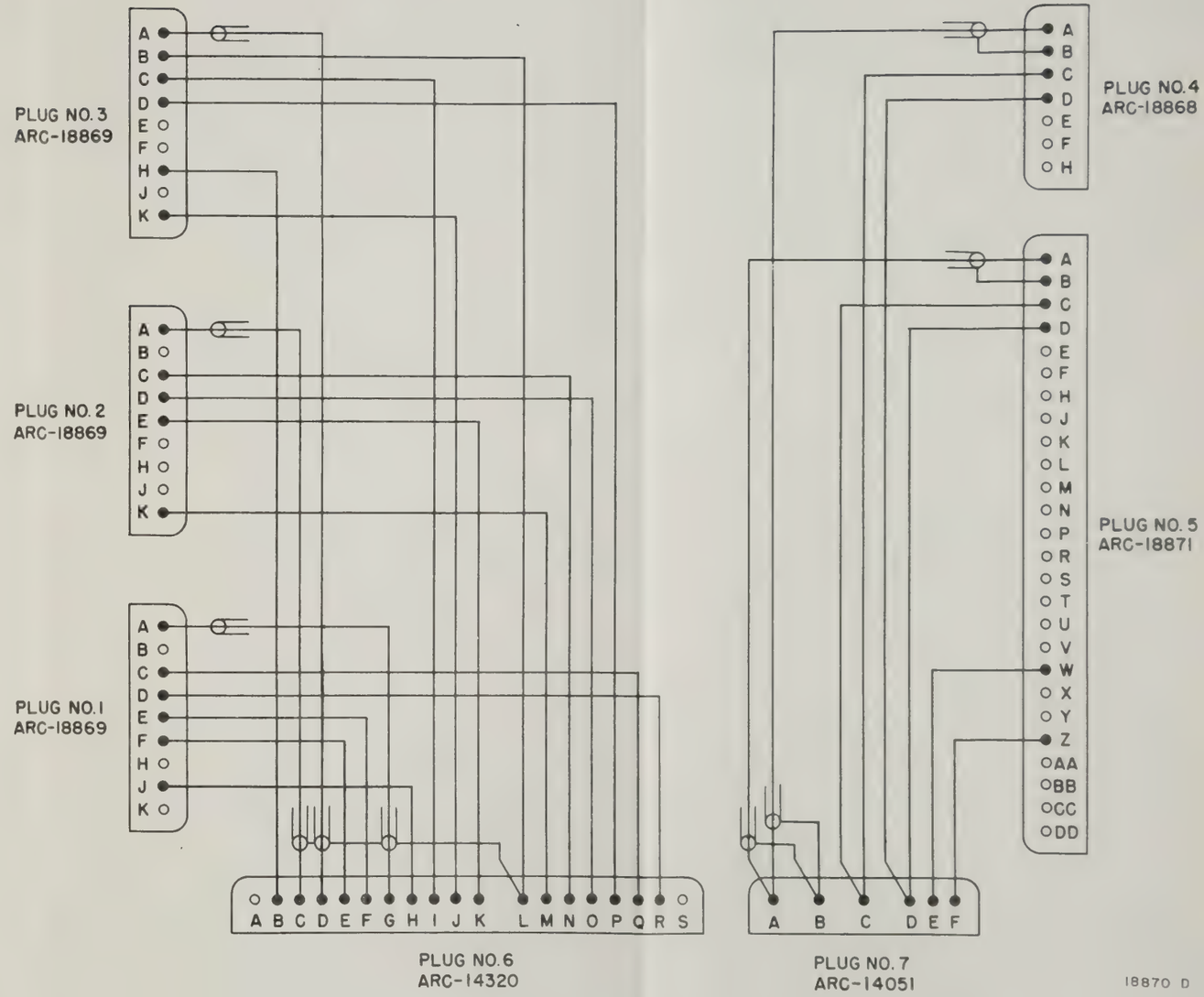


Figure 4-3. Cable Harness Assembly ARC-18870, Schematic Diagram

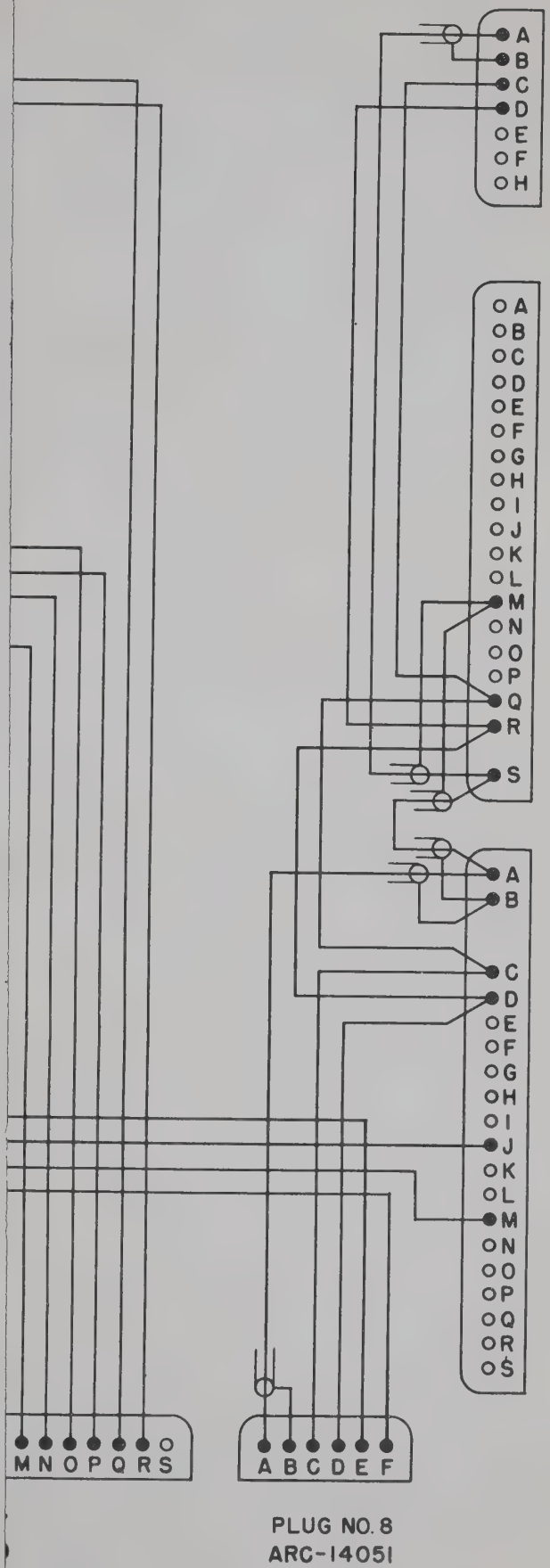


Figure 4-4. Cable Harness Assembly ARC-18876, Schematic Diagram

TABLE OF WIRE LENGTHS			
WIRE DESIGNATION	LENGTH (inches)	WIRE DESIGNATION	LENGTH (inches)
1A TO 2S(*)	14	4G TO 7G(*)	33
1C TO 2Q	14	4H TO 7H	33
1D TO 2R	14	4J TO 7J	33
2Q TO 3C	14	4L TO 7L	33
2R TO 3D	14	5C TO 7C(*)	31
2S TO 3A(*)	14	5D TO 7D(*)	31
3A TO 8A(*)	30 1/2	5E TO 7K	31
3C TO 8C	30 1/2	5F TO 7O	31
3D TO 8D	30 1/2	5G TO 7P	31
3L TO 6L	12	5H TO 7N	31
3M TO 6M	12	5I TO 7I	31
4B TO 7B	33	5J TO 7M	31
4C TO 7Q	33	5L TO 7L	31
4D TO 7R	33	6L TO 8E	30 1/2
4E TO 7E	33	6M TO 8F	30 1/2
4F TO 7F	33		

NOTE:

1. WIRES INDICATED BY ASTERISK (*) IN WIRE TABLE OR BY ⊖ IN WIRING DIAGRAM ARE NO. 22 STRANDED, TINNED COPPER BRAID, SHIELDED WIRES. SHIELDS ARE CONNECTED AS INDICATED. FIBERGLASS TUBING OF APPROPRIATE SIZE IS INSTALLED OVER ENDS OF BRAID (PIGTAIL) AND OVER ENDS OF WIRES TO PREVENT SHORTING TO OTHER TERMINALS. ALL OTHER WIRES ARE NO. 22 STRANDED COPPER, WITH FIBROUS GLASS BRAID AND OUTER PROTECTIVE COATING.

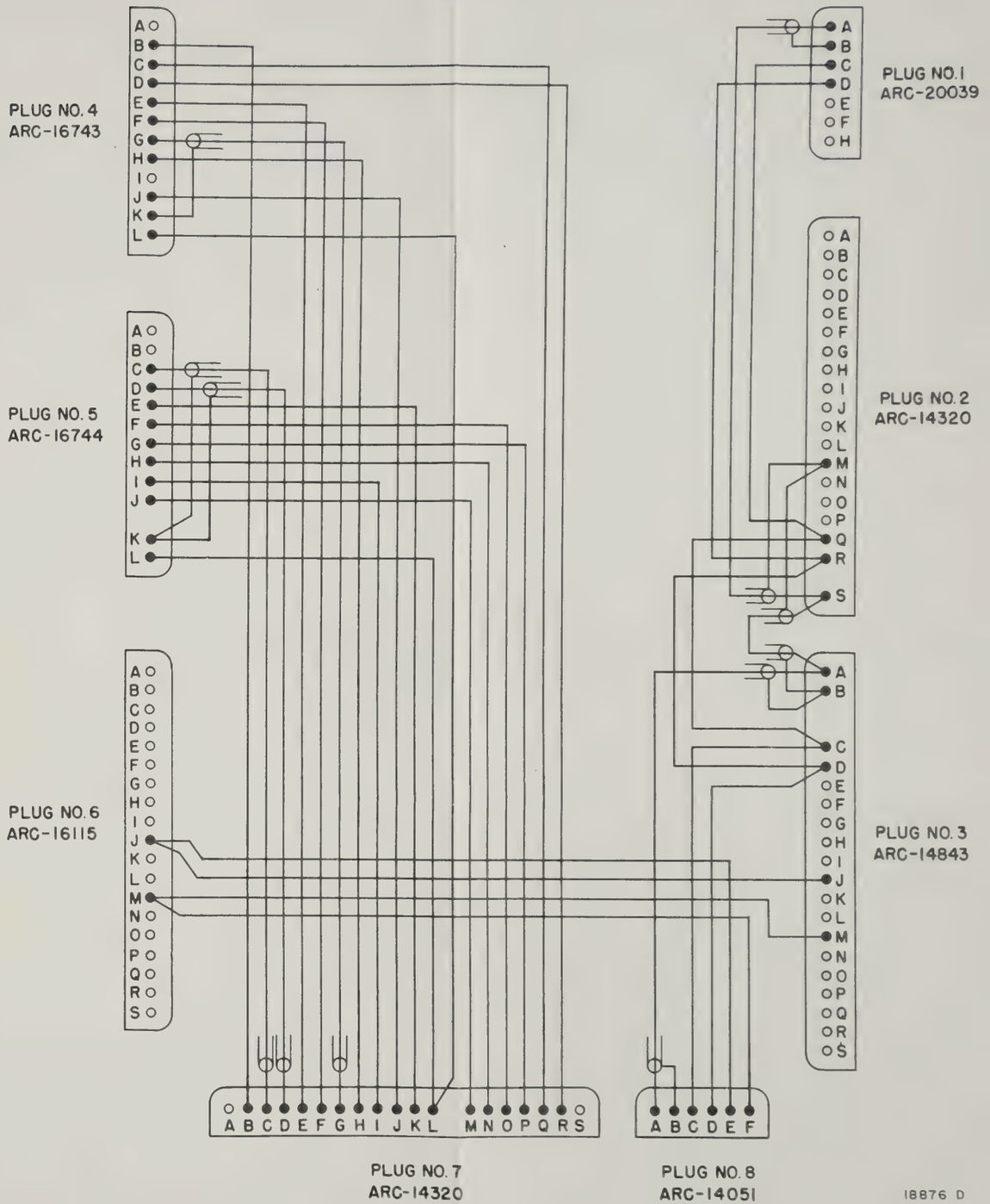


Figure 4-4. Cable Harness Assembly ARC-18876, Schematic Diagram

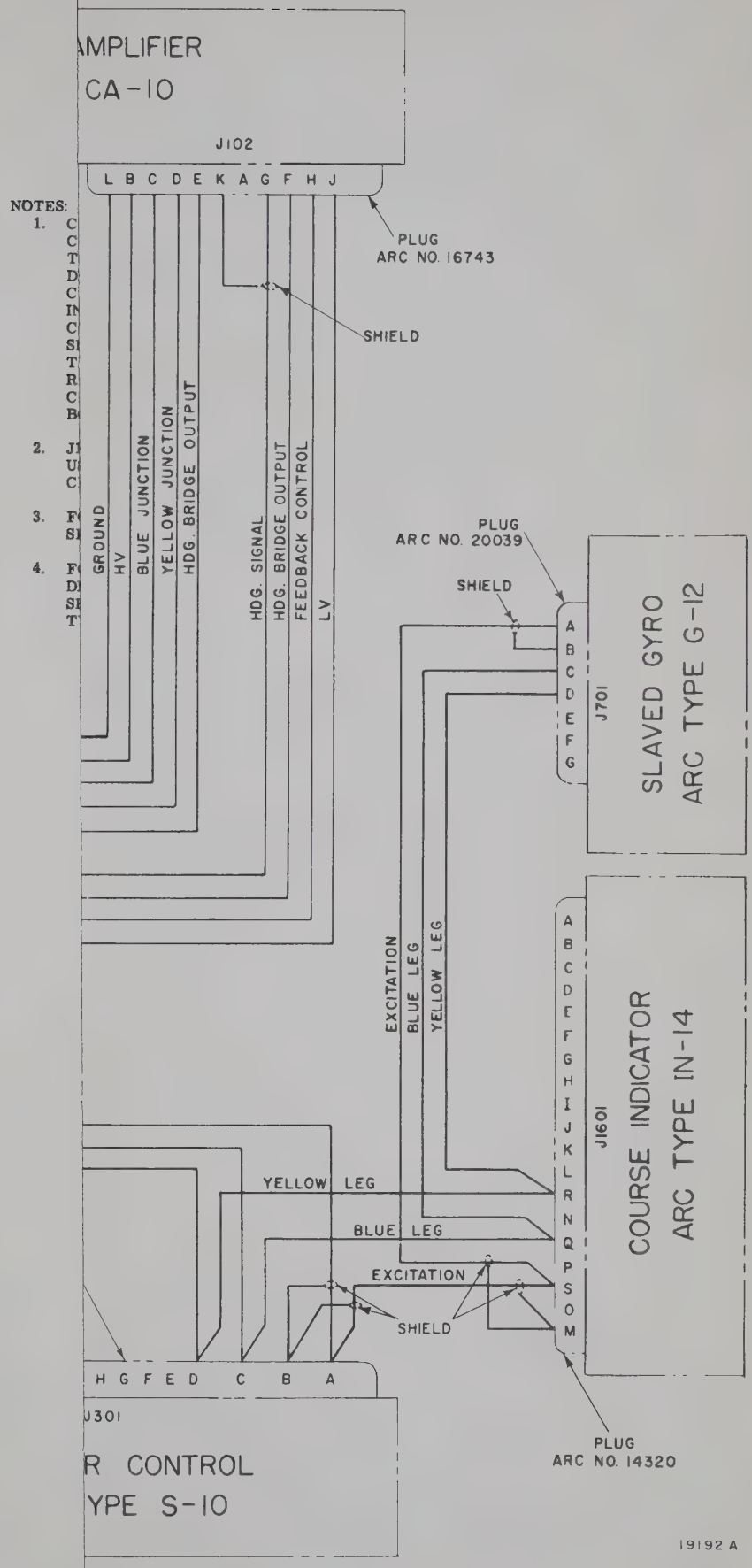


Figure 4-5. Bench Test Schematic Diagram for ARC Type BTK-17 Bench Test Kit and ARC Type CD-1 Course Director

NOTES:

1. COMPUTER AMPLIFIER ARC TYPE CA-10 IS REQUIRED FOR ALL CD-1 TESTS, EXCEPT IN-11 AND CRYSTAL DIODE TESTS. HOWEVER THE OTHER CD-1 COMPONENTS ARE TESTED INDIVIDUALLY AND SHOULD BE CONNECTED IN THE BENCH TEST SET-UP ONLY IF THEY ARE BEING TESTED. FOR FURTHER DETAILS, REFER TO INDIVIDUAL TEST PROCEDURES IN THIS INSTRUCTION BOOK.
2. J101 AND J114 OF H-17 ARE NOT USED FOR TESTING THE ARC TYPE CD-1 COURSE DIRECTOR.
3. FOR ASSOCIATED CABLING DIAGRAM, SEE FIGURE 2-2.
4. FOR INDIVIDUAL SCHEMATIC DIAGRAMS OF CD-1 COMPONENTS, SEE INSTRUCTION BOOK FOR ARC TYPE CD-1 COURSE DIRECTOR.

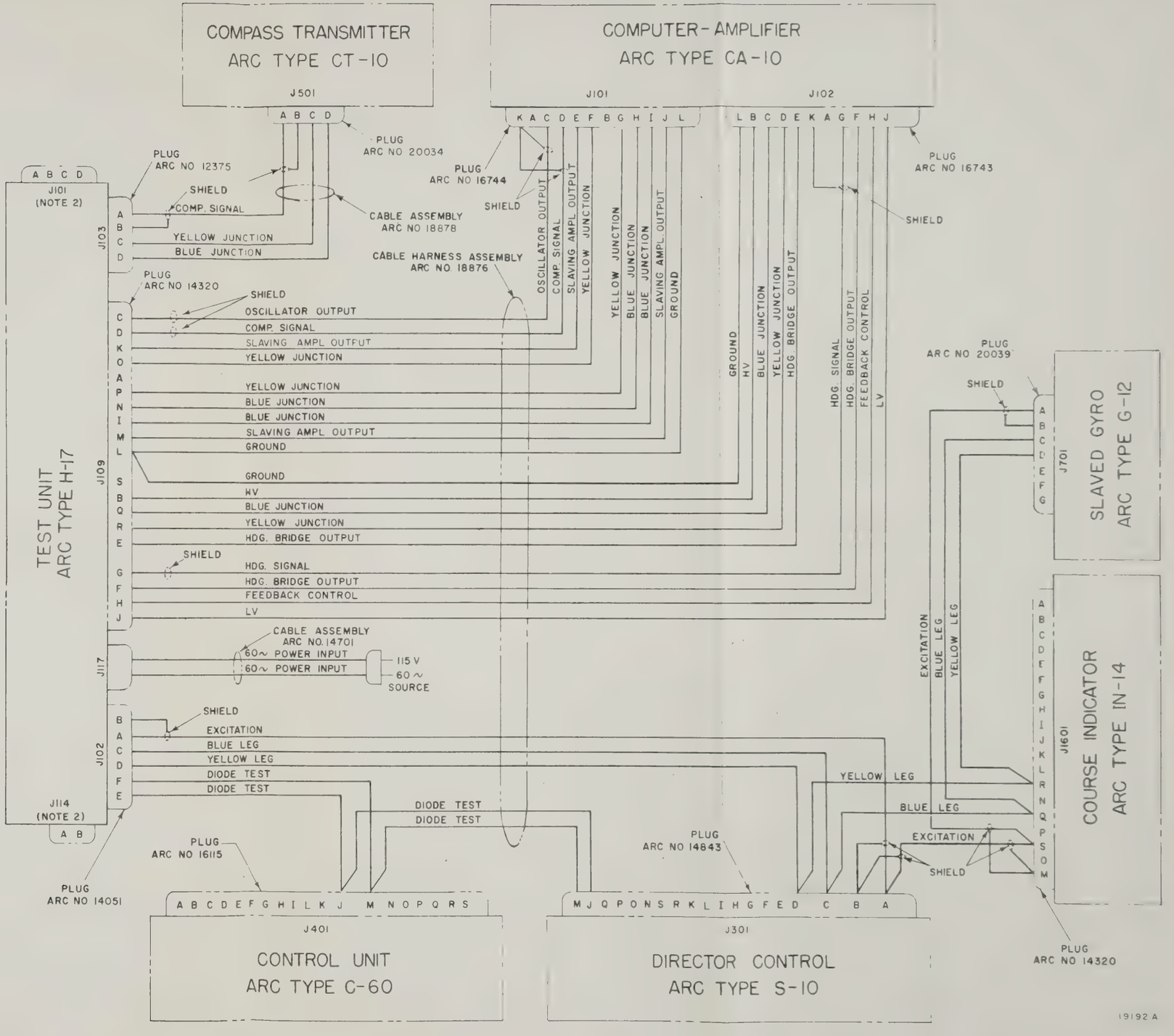


Figure 4-5. Bench Test Schematic Diagram for ARC Type BTK-17 Bench Test Kit and ARC Type CD-1 Course Director

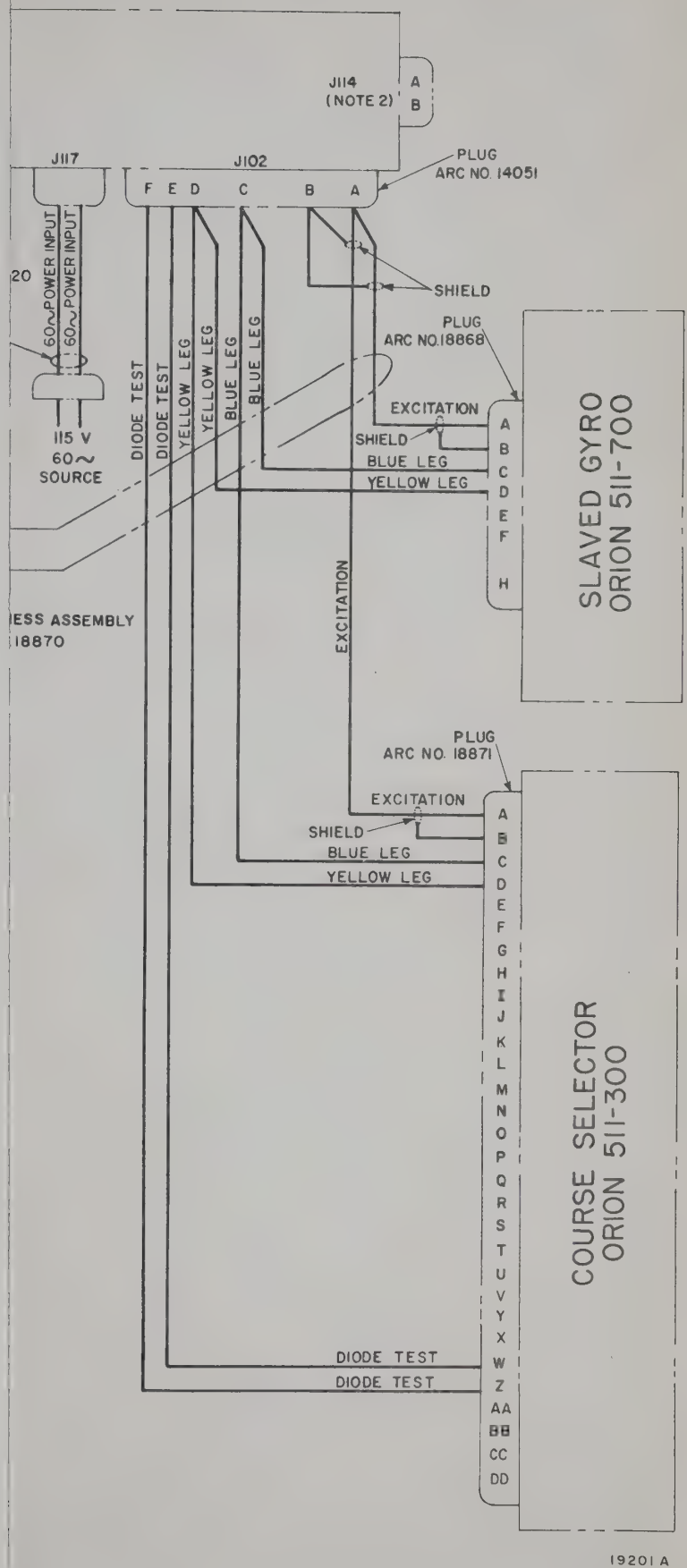


Figure 4-6. Bench Test Schematic Diagram for ARC Type BTK-17 Bench Test Kit and Orion Type CD-1 Course Director

NOTES:

1. ORION AMPLIFIER 511-600 IS REQUIRED FOR ALL ORION TYPE CD-1 TESTS, EXCEPT IN-11 AND CRYSTAL DIODE TESTS. HOWEVER, THE OTHER CD-1 COMPONENTS ARE TESTED INDIVIDUALLY AND SHOULD BE CONNECTED IN THE BENCH TEST SET-UP ONLY IF THEY ARE BEING TESTED. FOR FURTHER DETAILS, REFER TO INDIVIDUAL TEST PROCEDURES IN THIS INSTRUCTION BOOK.
2. J101 AND J114 ARE NOT USED FOR TESTING THE ORION TYPE CD-1 COURSE DIRECTOR.
3. FOR ASSOCIATED CABLING DIAGRAM, SEE FIGURE 2-4.

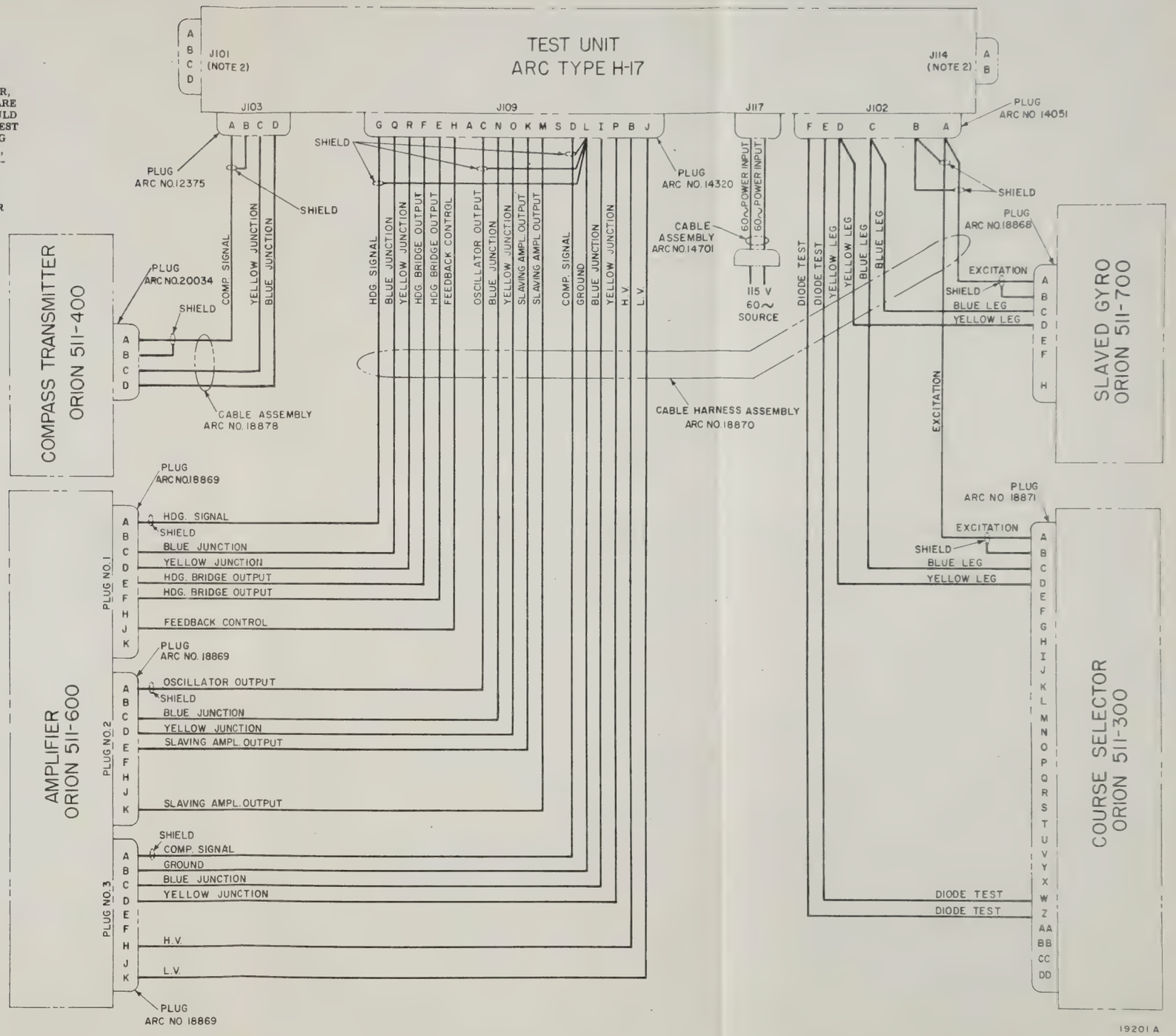


Figure 4-6. Bench Test Schematic Diagram for ARC Type BTK-17 Bench Test Kit and Orion Type CD-1 Course Director

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